School teachers and extension educators are invited to attend one or more of the five biotechnology workshops offered by Iowa State University this spring and summer. Participants can earn staff development or graduate credits while they learn. Stipends are available to help Iowa school teachers cover the costs of attending a summer workshop. ISU Extension personnel can receive a mileage reimbursement for summer workshops.

The evening workshop in April and May will be held at Kirkwood Community College in Cedar Rapids. The June and July workshops will be held in the Biotechnology Outreach Education Center on the ISU campus in Ames.

These workshops are funded through a grant from the U.S. Department of Agriculture (see acknowledgement at end of article) and by the ISU Office of Biotechnology. The $3.7 million USDA grant was awarded to a consortium of nine land-grant institutions in Minnesota, North Dakota, South Dakota, Wisconsin, and Iowa through the USDA's Initiative for Future Agriculture and Food Systems. The consortium will address economic, ethical, and social aspects of agricultural biotechnology. Research results will be used to develop education and outreach materials for diverse audiences to help them understand the benefits and risks of biotechnology products. The spring and summer workshops are part of the education and outreach effort.

To register for one or more of the workshops, complete the registration form on p. 7 and mail or fax it to Lori Miller at the address indicated on the form. For more information about the evening workshop at Kirkwood College, Cedar Rapids, contact June Teiglan at 1-800-798-9771, ext. 6767. For information about the workshops at ISU, please contact Lori Miller at 515-294-9818 or e-mail her at lorimill@iastate.edu.

**Evening Biotechnology Education Workshop I for Science, Family and Consumer Sciences, and Agriculture Educators**

*Kirkwood Community College, Cedar Rapids*

*April 4, 11, 18, and May 2 and 9*

1 staff development credit and/or
1 ISU graduate credit - $192

This workshop will be held in Cedar Rapids on Wednesday nights from 6:00-9:00 p.m. Educators are expected to attend all five sessions. This workshop is for science, agriculture, family and consumer science, or extension educators who want a basic knowledge of biotechnology. Participants will learn how to prepare and instruct laboratories in DNA isolation, transformation, and fingerprinting and DNA extraction from bacteria, kiwi, or onion.

*(continues on page 2)*

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**ISU Is Your Biotech Connection**

**For General Information or Free Lab Supplies for Iowa Educators:**

Contact Lori Miller, Office of Biotechnology, phone toll-free in Iowa 1-800-643-9504 from 8:00 a.m. to 5:00 p.m. weekdays, excluding university holidays, fax 515-294-4629, or e-mail lorimill@iastate.edu.

**For Educational Resources:**

Visit the ISU Office of Biotechnology's Internet homepage: [http://www.biotech.iastate.edu](http://www.biotech.iastate.edu).

**For Expert Answers to Biotech Questions:**

Contact Mr. Mike Zeller, Biotechnology Outreach Education Coordinator, phone toll-free in Iowa 1-800-643-9504, or e-mail mzeller@iastate.edu.

Contact Dr. Gary Comstock, Coordinator of ISU’s Bioethics Program, phone 515-294-0054, or e-mail comstock@iastate.edu.

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**IOWA STATE UNIVERSITY**

*Helping educators become their best.*
Workshops – continued from page 1

Biotechnology Education Workshop I for Science Educators
Biotechnology Outreach Education Center, ISU, Ames
June 11-15
2 staff development credits - $20 and/or
1-2 graduate credits - $206 per credit
$200 stipend available for Iowa school teachers ($50 per day)
Mileage reimbursement available for ISU Extension educators/personnel

This workshop course is directed at teachers who want to gain a basic knowledge of biotechnology. Teachers will learn how to prepare and instruct the laboratories in DNA extraction from bacteria, kiwi, or onion; DNA transformation; and DNA fingerprinting. Educators will prepare and perform the lab protocols as the students would do in class.

Biotechnology Education Workshop I for Agricultural Education Instructors
Biotechnology Outreach Education Center, ISU, Ames
June 19-21
1 staff development credit - $20 and/or
1 ISU graduate credit - $206
$150 stipend available for Iowa school teachers ($50 per day)
Mileage reimbursement available for ISU Extension educators/personnel

This course is a workshop focused on the basics of biotechnology and how it can be applied to agriculture. The basic technical knowledge and skills in this workshop will be useful in helping agricultural educators better understand biotechnology and how it will affect their curriculum and profession. Laboratory investigations and instruction will give educators experience with chymosin, Bt corn, and more.

Biotechnology Education Workshop I for Family and Consumer Sciences Educators
Biotechnology Outreach Education Center, ISU, Ames
June 26-28
1 staff development credit - $20 and/or
1 ISU graduate credit - $206
$150 stipend available for Iowa school teachers ($50 per day)
Mileage reimbursement available for ISU Extension educators/personnel

This workshop course focuses on the basics of biotechnology and how it can be applied in human nutrition and health. The basic technical knowledge and skills in this workshop will be useful in helping family and consumer science educators better understand biotechnology and how it will affect their curriculum and profession.

Biotechnology Education Workshop II–Advanced Workshop for Science, Agriculture, and Family and Consumer Science Educators
Biotechnology Outreach Education Center, ISU, Ames
July 9-13
2 staff development credits - $20 and/or
1-2 graduate credits - $206 per credit
$200 stipend available for Iowa school teachers ($50 per day)
Mileage reimbursement available for ISU Extension educators/personnel

This advanced workshop is open to science, agriculture, and family and consumer science educators who have attended one of the previous biotechnology workshops. Educators will learn how to prepare and instruct advanced laboratories in biotechnology. Activities will include showing marker gene expression, DNA isolation, recombinant DNA techniques, DNA amplification, restriction analysis of DNA, and more. Educators will prepare and perform the lab protocols that their students could do in class.

These workshops received support through a grant from the Cooperative State Research, Education, and Extension Service, U.S. Department of Agriculture, under Agreement No. 00-52100-9617. Any opinions, findings, conclusions, or recommendations expressed during these workshops are those of the instructors and participants and do not necessarily reflect the view of the U.S. Department of Agriculture.

Teachers Asked to Nominate Students for ISU’s Science in Agriculture Day
April 19, 2001, will mark the 13th anniversary of Science in Agriculture Day at Iowa State University. The event is sponsored by the College of Agriculture for students in grades 10-12 who are nominated by their teacher. Students will have the opportunity to learn how science interacts with agriculture, while exploring the ISU campus, the agriculture curriculum, and career opportunities in agriculture.

Students can choose to attend three of the 25 hands-on sessions to be offered. Past sessions have included Ethics in Science and Bioethics, DNA and Agriculture, Dissecting Insect Diversity, Urban Forestry, How a Cow Can Make Milk from Your Old Term Paper, and An Interactive Computer Tour of the Weather. Science in Agriculture Day activities will begin at 9:00 a.m. and end at 2:30 p.m.

High school science and agriculture teachers are being asked to nominate students to attend this year’s Science in Agriculture Day. Teachers should have received nomination materials
in the mail in January. Nominations are due March 9. For more information or to obtain nomination materials, please contact the event coordinator, Ebby Luvaga, phone 515-294-5436 or e-mail luvaga@iastate.edu. Information and nomination forms are also available at http://www.agron.iastate.edu/rc/sad.html.

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Project BIO Online Biology, Zoology, Genetic Courses for Summer 2001

Teachers and high school students from around the world can earn college credits by taking online courses through Iowa State University's Project BIO. Courses offered for summer 2001 include Biol 109-Introductory Biology; Biol 123-Environmental Biology; Zool 155-Basic Human Physiology and Anatomy; and Gen 308/508-Biotechnology in Agriculture, Food, and Human Health.

For more information, check the Project BIO web site at http://project.bio.iastate.edu and follow the Online Courses link, or contact Dr. Tom Ingebritsen, phone 515-294-9432, e-mail tsingebr@iastate.edu. High school students in Iowa who want to take the courses under the Postsecondary Enrollment Options Act will find details about this program at http://project.bio.iastate.edu/Courses/hsinfo.htm.

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News from the Biotechnology Outreach Education Center

By Mike Zeller
BOEC Coordinator

It's hard to believe that spring is just around the corner and that 25+ inches of snow will soon melt, helping to produce another beautiful green landscape in Iowa. Spring brings a rush of requests for visits to the Iowa State University campus and activities in the Biotechnology Outreach Education Center (BOEC). Since the first weeks in January, scheduling for the spring calendar has been busy. If you're planning to bring your class/students to the BOEC this spring, you should call our office soon to schedule. Phone Lori Miller at 515-294-9818 (toll-free in Iowa at 800-643-9504) or e-mail lormill@iastate.edu.

A new protocol and its PowerPoint® presentation have been added to the Office of Biotechnology web site at www.biotech.iastate.edu. DNA in My Food??? has activities for extracting DNA from bananas and making a banana/strawberry smoothie to demonstrate to students that the food they eat contains DNA. To some this may seem obvious, but current surveys show that up to 25% of adults believe that DNA is only found in living organisms that have been genetically engineered. Although the activities were originally meant for middle school-aged children, we've found it well received by middle-aged adults.

Workshops for Teachers

We will be offering spring and summer biotech workshops this year. If your curriculum needs a boost, you want to upgrade your content knowledge, you need a review from a previous workshop, or you want to learn advanced techniques and content, then one or more of these 2001 spring and summer workshops is for you. See the article on p. 1 for more details about the workshops.

If you can't make it to one of the spring or summer workshops, two fall workshops are being planned. Dates and times are not final, but one will be held on the ISU campus in the BOEC and the other in the AEA 2 region. More details will be made available in future editions of the Iowa Biotech Educator and on the web site.

PCR for High School Students

December 8, 2000, marked the first time high school students performed a PCR (Polymerase Chain Reaction) activity in the Biotechnology Outreach Education Center. Dr. Gary Polking, manager of the DNA Sequencing and Synthesis Facility, instructed Kim Petersen's advanced biology class from Guthrie Center in the principles and techniques of PCR. Students amplified pieces of their own DNA and had them analyzed using agarose gel electrophoresis. Even though the whole process takes more than the three hours we allowed in the lab, we were able to run the reaction in a thermal cycler and then electrophorese the products the next day after the students had returned home. We then took digital photos of the gels and e-mailed them to the teacher for analysis. If you would like your class to experience this PCR activity, you should plan far ahead to reserve time in Dr. Polking's busy schedule. The activity takes at least three hours to complete. The best time for a school group is in the morning from 9:00-12:00. Most groups then follow their time in the BOEC with tours of facilities on the ISU campus in the afternoon.

Pre-Service Biotech Education

One of our goals at the BOEC is to provide biotech training for ISU undergraduate students headed for teaching careers in science, agriculture, or family and consumer sciences. On January 17-18, about 20 undergraduate students in Agricultural Education spent a total of six hours at the BOEC. They learned how to prepare and teach laboratories in DNA extraction, gel electrophoresis, and bacterial transformation.

IPTV

Iowa Public Television (IPTV) currently is producing a
segment for their Explore More series titled Bioengineering—Food We Eat and Biomedicine—Tinkering with Nature. Plans are to broadcast this segment later this year. We have been assisting IPTV in the production of these segments.

On December 15, an IPTV media crew filmed Karen Largeeese's biology class from Southeast Polk High School doing biotechnology activities in the Biotechnology Outreach Education Center. On January 25 and 26, I traveled to the IPTV studios in Johnston to present two ICN sessions about how biotechnology is applied in today's medicine. The sessions were divided into three parts, the human genome project, gene therapy, and the ethics of biomedicine. Fourteen middle and high school ICN classrooms took part in the two sessions and provided some very exciting interaction.

IPTV is considering similar ICN sessions later this year. You can check the Learn with IPTV link at http://www.iptv.org for more information on how to involve your class(es).

**Reminders**

Illustrated lab activities that are available as PowerPoint® downloads and in html format on our web site include micropipettor practice, DNA extraction, bacterial transformation, and DNA fingerprinting. Presentations include illustrations on how to prepare the activities and step-by-step student instructions for each activity.

We have increased the amount of free supplies that are available to teachers for our transformation protocols.

We still have the free CDs A Short Course on Biotechnology available. Call the toll free number on p. 1 to receive your CD.

**Education Reports**

**Jay Staker Joins ISU Extension**

Jay Staker is the new director of ISU Extension's Science, Engineering, and Technology (E-SET) program and the new associate director of the Iowa Space Grant Consortium. Staker began his new dual job on January 16.

In his E-SET role as a youth initiative specialist, Staker will be overseeing extension's science outreach services to K-12 educators in both formal school settings and informal youth groups. The E-SET program offers science teacher training events, curriculum kits, answers to questions by phone or e-mail, and other support. Grants for teaching science are available through the Iowa Space Grant Consortium. Staker says that E-SET will continue its involvement in biotechnology education and will work closely with ISUs Biotechnology Outreach Education Center.

Prior to joining ISU Extension, Staker was a high school science teacher for 24 years at the Ballard-Huxley school district in Huxley, Iowa. He taught biology, anatomy and physiology, and physical science. Staker also was a genetics instructor for ISU's CyTAG program for talented and gifted science students and served as a resource for other teachers through the master teacher program of the ISU Office of Biotechnology.

Staker invites science teachers and others, such as 4-H volunteers, who are involved in informal science education to contact him at the following address:

Jay Staker, Youth Initiative Specialist
Extension - Science, Engineering & Technology (E-SET)
Associate Director, Iowa Space Grant Consortium
32 Curtiss Hall, Ames, IA 50011
Phone 515-294-8417
Fax 515-294-4443
E-mail jstaker@iastate.edu

**Grants/Competitions**

**March 9 Deadline for Science Fair**

March 9 is the deadline for entry forms for the 45th year of competition of the Iowa State Science and Technology Fair. The fair will be held March 30-31, 2001, at Iowa State University's Hilton Coliseum in Ames. A number of scholar-
ISU Office of Biotechnology Homepage
http://www.biotech.iastate.edu

USDA Consortium Grant Web Site
http://www.biotech.iastate.edu/publications/IFAFS/default.html

A new page on the ISU Office of Biotechnology homepage provides links to nine land-grant institutions who have formed a consortium to study the social, economic, and ethical aspects of agricultural biotechnology. Initially, the new page will provide links to the institutional homepages. As the consortium's work progresses, check the site for new additions, such as research reports and information about extension/outreach efforts.

Step-by-Step Tutorials for Selected Lab Activities
http://www.biotech.iastate.edu/publications/ppt_presentations/default.html

If you haven't checked out the step-by-step illustrated PowerPoint® and HTML (web page) tutorials of laboratory activities available on the ISU Office of Biotechnology web site, take a look and check back periodically for new additions. The five laboratory activities currently available are:

- Using a Micropipettor
- DNA Fingerprinting
- Fruit Cup DNA Extraction
- Transformation
- DNA in My Food?

Educators can use the tutorials as refresher courses for themselves or as a teaching resource for their classes. The activities can be viewed as HTML files using a web browser such as Netscape®, or they can be copied to a computer hard drive and viewed with either Microsoft PowerPoint® or a free PowerPoint® viewer. The presentations were designed by Mike Zeller, biotechnology outreach education coordinator.

Waksman Student Challenge
http://avery.rutgers.edu/WSSP/Begin/index.html

The Waksman Student Scholars faculty at Rutgers University have added some online tutorials to their monthly student challenge site. Tutorials include the structure of DNA, RNA, and protein; replication; transcription; translation; genes and chromosomes; and the basic principles of genetics. To view some of these tutorials, the plug-in Chime is required and is available free on the site.

The Waksman Student Scholars Program currently is supported by the National Institutes of Health and Amersham Pharmacia Biotech. Other past supporters include The Howard Hughes Medical Institute, Bell Atlantic, Schering-Plough, Merck and Co., and the National Science Foundation.

Ag-West Biotech Transgenic Plants
http://www.agwest.sk.ca/index1.html

The Canadian company Ag-West Biotech has developed an animation of how transgenic plants are developed. From the main site, follow the “Education Connection” and “How do we develop transgenic plants?” links to find the animation. A Shockwave Flash 3 plug-in is needed to view the animation and can be downloaded from the site.

About Biotech – Access Excellence
http://www.accessexcellence.org/

The About Biotech section of the Access Excellence site has a number of bioethics resources. From the main homepage, follow the links for About Biotech and then Issues and Ethics to find resources for animal genome and plant genome projects, environmental management, gene therapy, social practices and policies, and bioethics and you. Other biotechnology resources available on the site include applications of biotechnology, a career center, and a graphics gallery. The Access Excellence site, originally developed by Genentech, Inc., is now sponsored by the National Health Museum.

Electronic Scholarly Publishing
http://www.esp.org/

This site has a classical genetics section with a chronological timeline of what was going on in the world when genetics discoveries were made. Site visitors can find articles about genetics by Aristotle in 350 B.C. or by authors in 2000. The Human Genome Project is supporting the expansion of the site’s classical genetics section.

Under the general publications link are many resources in pdf form by the Human Genome Project, including To Know Ourselves; Your Genes, Your Choices; and Primer on Molecular Genetics. Site visitors need Adobe® Acrobat® Reader, available free on the site, to view these publications.
Tips for Teachers

DNA in My Food???

The following DNA extraction protocol is excerpted from the DNA in My Food? activity developed by Mike Zeller, ISU’s Biotechnology Outreach Education Coordinator. To counteract the misconception that DNA is found only in genetically modified foods, Mike recommends reserving some of the blended banana from step 1 and using it in a fruit smoothie for your class. The entire protocol with color photos can be viewed in html or downloaded as a PowerPoint® presentation from http://www.biotech.iastate.edu. Follow the Step-By-Step tutorials link.

DNA Extraction

The process of extracting DNA from a cell is the first step for many laboratory procedures in biotechnology. The scientist must be able to separate DNA from the unwanted substances of the cell gently enough so that the DNA does not denature (break up). You will prepare a solution of banana treated with salt, distilled water, and shampoo (detergent). The detergent breaks down the cell membrane by dissolving the lipids (fatty molecules) and proteins of the cell and disrupting the bonds that hold the cell membrane together. The detergent then forms complexes with these lipids and proteins, allowing them to be filtered out of solution by the coffee filter. The cells’ DNA is left in the filtrate. The salt allows the DNA to precipitate out of filtrate in cold alcohol solution (Mg and Cl ions). Each cell contains 9 feet of DNA. In an average meal, you eat about 55,000,000 cells or about 93,205 miles of DNA.

Step 1
- In a blender, mix a ratio of one banana per one cup (250ml) of distilled water.
- Blend for 15-20 seconds, until the solution is a mixture.

Step 2
- In one of the 5 oz cups, make a solution consisting of 1 teaspoon of shampoo and two pinches of table salt.
- Add 20 ml (4 teaspoons) of distilled water or until the cup is 1/3 full. Dissolve the salt and shampoo by stirring slowly with the plastic spoon to avoid foaming.

Step 3
- To the solution you made in step 2, add three heaping teaspoons of the banana mixture from step 1.
- Mix the solution with the spoon for 5-10 minutes.

Step 4
- While one member of your group mixes the banana solution, another member will place a #2 cone coffee filter inside the second 5 oz plastic cup.
- Fold the coffee filter’s edge around the cup so that the filter does not touch the bottom of the cup.

Step 5
- Filter the mixture by pouring it into the filter and letting the solution drain for several minutes until there is about 5 ml (covers the bottom of the cup) of filtrate to test.

Step 6
- Obtain a test tube of cold alcohol. For best results, the alcohol should be as cold as possible.

Step 7
- Fill the plastic pipette with banana solution.

Step 8
- Add the solution to the alcohol.
- Let the solution sit for 2 to 3 minutes without disturbing it. It is important not to shake the test tube.

Results
- You can watch the white DNA precipitate out into the alcohol layer.
- DNA has the appearance of white, stringy mucus.
**Registration Form for 2001 Biotechnology Spring and Summer Workshops**

Registrations for April workshop due by MARCH 28  
Registrations for June and July workshops due by JUNE 1

Name ______________________________________________________________________________________________________

School district or extension area ________________________________________________________________________________

Subject areas taught___________________________________________________________________________________________

Home (summer) mailing address __________________________________________________________________________________

Work phone ____________________    E-mail__________________________________    Home phone _______________________

I would like to register for the following Biotechnology Education Workshop(s):

_____ Evening Workshop I for Science, Family and Consumer Sciences, and Agriculture Educators, April 4-May 9

_____ Workshop I for Science Educators, June 11-15

_____ Advanced Workshop II for Science, Agriculture, and Family and Consumer Sciences Educators, July 9-13

Credit available: 1-2 staff development credits AND/OR 1-2 graduate credits  
(See workshop descriptions on p. 1 for details.)

Credit payment and housing information will be sent to you when your registration is received.

**Register early! Class size is limited.**

Return this registration form by mail or fax to:  
Lori Miller  
Office of Biotechnology  
1210 Molecular Biology Building  
Iowa State University  
Ames, Iowa  50011-3260

Fax: (515) 294-4629 • Phone: (515) 294-9818 or toll-free in Iowa 1-800-643-9504 • E-mail: lorimill@iastate.edu

These workshops received support through a grant from the Cooperative State Research, Education, and Extension Service, U.S. Department of Agriculture, under Agreement No. 00-52100-9617. Any opinions, findings, conclusions, or recommendations expressed during these workshops are those of the instructors and participants and do not necessarily reflect the view of the U.S. Department of Agriculture.

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**Lab Notes**

**Additional Step for Transformation**

Educators who downloaded or received printed copies of the ISU Office of Biotechnology ampicillin and red colony transformation protocols before January 23, 2001, should add a step to each protocol. Under the Pre-Lab – Day 1 section, please add a step 2 that directs you to store the B1 and B2 tubes on ice in the refrigerator overnight. Current printed copies and web versions of the protocols include the new step. Thanks to the alert educators who caught the omission!
About the ISU Public Education Program in Biotechnology...

Iowa State University's Public Education Program in Biotechnology is supported by AgrEvo/Plant Genetic Systems; Ajinomoto U.S.A., Inc./Heartland Lysine, Inc.; Cargill; Genencor International, Inc.; Golden Harvest Research; Growmark; The Greater Cedar Rapids Foundation–Diamond V Mills Donor-Advised Fund; the Iowa Farm Bureau Federation Agricultural Foundation; the Iowa Soybean Promotion Board; Kemin Industries, Inc.; MBS, Inc.; Novartis Seeds, Inc.; Pioneer Hi-Bred International, Inc.; the Roy J. Carver Charitable Trust; West Central Cooperative; and private individuals.

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