Bt Curriculum to be Released This Fall

A four-module curriculum titled *Bacillus thuringiensis: Sharing Its Natural Talent with Crops* is scheduled for release this fall by Iowa State University's Office of Biotechnology and ISU Extension's Science, Engineering, and Technology Program. The curriculum was written for high school teachers or extension educators to use with grades 9-12 or adults.

The four modules were designed to be used independently so that educators who do not have time to complete the entire curriculum can do single modules or activities. Background information for teachers, student handouts, Internet ideas, and overhead transparency masters are included with each module. A brief description of the four modules follows.

**I. The Science Behind Bt Crops** – Topics covered are the nature of Bt and overviews of genetic engineering, tissue culture, and transformation. Laboratory activities include DNA extraction from fruit and bacterial transformation of *E. coli* using ampicillin resistant and lacZ genes.

**II. Insect-Resistant Crops Using Bt** – Topics are the development of Bt corn, cotton, and potatoes. Laboratory activities include exposing Bt corn to the larvae of European corn borers and detecting Bt protein in corn leaf tissue by using a lateral flow immunochromatographic test.

**III. Production Issues for Bt Crops** – Topics include the economic trade-offs of growing Bt crops and the establishment of refuges. Activities explore how refuges affect the development of an insect's resistance to Bt and the Environmental Protection Agency's guidelines for refuges.

**IV. Ethical, Social, and Legal Issues Related to Bt Crops** – Topics include identity preservation; consumer choice; pre- or post-harvest contamination; tolerances; export markets; and ethical, social, and legal questions. Activities illustrate how different tolerances for GMO content affect where grain can be marketed and how a model for building and evaluating ethical arguments can be applied to Bt planting decisions.

The curriculum was prepared with support from a U.S. Department of Agriculture grant to nine land-grant institutions in Iowa, North Dakota, South Dakota, Minnesota, and Wisconsin. The purpose of the grant is to study the social, economic, and ethical aspects of agricultural biotechnology.

Watch the next issue of the *Iowa Biotech Educator* for information about how to order the curriculum.

This curriculum 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 in this publication are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture.
Biotech Workshop for All Extension Personnel – November 6-8

Extension employees are invited to attend a biotechnology workshop designed just for them by Iowa State University’s Office of Biotechnology and ISU Extension’s Science, Engineering, and Technology Program. The three-day workshop will be held from 1 p.m. on November 6 to noon on November 8 at the Biotechnology Outreach Education Center on the ISU campus in Ames.

All extension employees are welcome, including those working in the areas of agriculture, families, community, and 4-H. Iowa extension personnel who attend will receive up to $50 per day to offset their travel expenses, with a maximum reimbursement of $100.

Workshop speakers will address consumer and producer issues, agriculture sustainability, ethics, and current research areas. Iowa State speakers scheduled for the workshop are:

Bioethics in Extension, Ethics of Human Stem Cell Research – Kristen Hessler, Office of Biotechnology and Department of Philosophy and Religious Studies

Sustainable Agriculture in Iowa – Fred Kirschenmann, Leopold Center for Sustainable Agriculture

Consumer Issues with Biotechnology – Lisa Lorenzen, Office of Biotechnology and Office of the Vice Provost for Research and Advanced Studies

Ecological Perspectives on Bt Corn – John Obrycki, Department of Entomology

Stem Cell Research – Don Sakaguchi, Department of Zoology and Genetics

The laboratory portion of the workshop will include DNA laboratory procedures and diagnostic tests for traits available to producers or consumers. Laboratory activities include:

DNA in My Food? – extracting DNA from fruit and making a smoothie

DNA Fingerprinting – using electrophoresis to produce DNA fingerprints

Lateral Flow Tests – detecting Bt protein in plants and seeds

Thin-Layer Chromatography – analyzing the sugar content of high sucrose soybeans

For more information about workshop content, please phone Mike Zeller, 515-294-5949, mzeller@iastate.edu, or Jay Staker, 515-294-8417, e-mail jstaker@iastate.edu.

To register for the workshop, please phone Lori Miller, 515-294-9818 or toll-free in Iowa 1-800-643-9504, or e-mail lorimill@iastate.edu. The registration deadline is October 25.

To Find Out Fast, Choose E-Mail

Are you a K-12 teacher who wants quick notification of biotechnology education workshops and other events? Then sign up for the ISU Office of Biotechnology's teacher e-mail list. All you need to do is send an e-mail message to Lori Miller, lorimill@iastate.edu, saying you want to be added to the teacher e-mail list. If you are an ISU Extension educator, you don't need to do a thing. The Office of Biotechnology already uses the ISU Extension e-mail lists to reach you.

Subscribe to Bioethics in Brief by E-mail

Bioethics in Brief is published six times a year by the Office of Biotechnology at Iowa State University. This electronic newsletter contains articles, events, and links to web sites to help educators teach ethics in the classroom.

K-12 teachers and extension educators can receive each issue by e-mail. To sign up for e-mail delivery, send an e-mail message to editor Dena Huisman, dhuisman@iastate.edu, telling her that you want to receive Bioethics in Brief. To view recent issues of Bioethics in Brief on the Internet, go to http://www.biotech.iastate.edu/Bioethics/publications.html.

News from the Biotechnology Outreach Education Center

By now you have had a chance to get settled into your classroom routine (if there is such a thing in education) and are planning your activities for the academic year. Let Iowa State's Biotechnology Outreach Education Center (BOEC) be part of your students' learning experience. Remember, the BOEC is not only a place to visit for exciting hands-on activities and presentations, but we'll be happy to come to your school. For more information about scheduling a trip to the BOEC or a visit to your school, contact Lori Miller or me toll-free in Iowa at 1-800-643-9504 or e-mail us at lorimill@iastate.edu or mzeller@iastate.edu.

We spent the month of September updating the web site, editing and posting several new protocols, creating the second editions of the education CD and BOEC brochure, and analyzing the activity/usage of the center this past year.

Web Site Upgrade

The Office of Biotechnology's web page at http://www.biotech.iastate.edu has changed its appearance to make it more user-friendly.
friendly and easier to navigate. The main titles and each of their subtitles are active links to the most heavily used sections of the site. For example, under the “Education” title are links to curriculums, protocols, supplies and equipment, and outreach. Click on any of these subtitles and you will immediately go to that area on the web site.

I want to remind you to keep visiting the “Education” section on the web site for new information and announcements, such as the dates for the summer 2003 biotechnology education workshops for teachers. There has been great interest in the basic and advanced workshops over the past couple of summers, and space has been limited. Check the web site periodically and mark the dates on your calendar early.

New Activities, CD, and Brochure

The educational resources web page at http://www.biotech.iastate.edu/Educational_resources.html has several new protocols and activities posted under “Classroom Lab Activities.” They include the lateral flow test for Bt protein in corn for both green tissue and seed. We are developing the next generation of instructional aids with a QuickTime™ movie of the PCR PowerPoint® presentation. If this is successful, we hope to develop more activities that can help teachers explain biotechnology concepts or can be used as individual enhancement activities for students.

A new, updated version of the educational resources CD is ready for distribution. The CDs are free to Iowa teachers. To get your updated CD, contact Lori Miller (see contact information at the beginning of this article).

We also have a new brochure about the educational services and materials offered by the BOEC. View the brochure online at http://www.biotech.iastate.edu/publications/BOEC/default.html or contact Lori Miller for a copy.

BOEC By the Numbers

Every year we analyze all the on- and off-site BOEC events. Because the BOEC is so new, this year marked the first time we could compare activity levels for multiple years. We found that the use of the center increased almost 50 percent from July 2001 to July 2002 compared with the previous year. During this past year, 2,016 people were served in the center, 948 people were served at various locations throughout the state, and 12,637 Iowa students in 121 districts across the state had a chance to experience one or more hands-on activities with the free equipment and supplies prepared and shipped from the BOEC, courtesy of ISU’s Office of Biotechnology. This represents a 7 percent increase in students served and a 12 percent increase in the number of schools requesting materials and supplies.

BOEC in Action

In September and October, the BOEC hosted visits from Carlisle High School, Boone Home School, ISU’s Toying with Technology pre-service elementary teachers, ISU’s Program for Women in Math and Science, and Ogden Middle School. The BOEC stepped away from its campus home to participate in the Farm Progress Show at Alleman, the Corn Festival at Living History Farms near Urbandale, and the Iowa Science Teachers Conference in Des Moines. In late October, I will fly to Cincinnati to present a simulation titled “Biotechnology: DNA to Product” at the National Association of Biology Teachers National Convention.

It was good to see many of you at our booth and presentations during the Iowa Science Teachers Conference in Des Moines on October 17th. The conference rates as the premiere science teacher conference in the Midwest, and this year was no exception. I hope you had a chance to sign up for our updated educational CD and took one of the new brochures home with you.

National DNA Day

April 25, 2003, has been designated as National DNA Day in honor of the 50th anniversary of the geometric description of the double helix by James Watson and Francis Crick (see story on p. 5). Watch the Office of Biotechnology web site and the Iowa Biotech Educator for special events and activities to commemorate this milestone in science.

Have a great fall!

QuickTime™ is a trademark of Apple Computer, Inc. PowerPoint® is a registered trademark of Microsoft Corporation.

Project BIO Offers Online Courses

Teachers and high school students can earn college credits online through Iowa State’s Project BIO. Science courses offered for three credits during spring semester 2003 include:

- Biol 109 Introductory Biology
- Biol 123 Environmental Biology
- Biol 202 Principles of Biology II
- Zool 155 Basic Human Physiology and Anatomy
- Gen 308/508 Biotechnology in Agriculture, Food and Human Health

(continues on p. 4)
For more information, check the Project BIO web site at http://project.bio.iastate.edu and follow the Online Courses link, or contact 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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**BIOtechnology ethics**

By Kristen Hessler
Bioethics Outreach Coordinator

As the school year progresses, you may find time to add new elements to your classes. If so, consider bioethics! We offer training and activities to help you design and implement a bioethics lesson plan for your classes. Here are some resources we're working on now:

**Online Bioethics Course**

The online bioethics course is taking a break this fall, and we're using the time to make improvements! I'll be participating in a discussion group organized by ISU's Instructional Technology Center, where we'll discuss the book *Building Online Communities in Cyberspace* by Rena Palloff and Keith Pratt. Look for a new and improved course next January!

A more long-term change in the works is to expand our bioethics online course offerings. While we have so far offered a one-credit course each semester, by next fall we hope to be able to offer at least three one-credit modules per semester. That way, you can earn one, two, or three credits in a single semester, depending on your interests and how much time you have.

**Activities Under Development**

I'm working on new educational activities that focus on ethics and animals. For help, I attended a conference called *Biotech in the Barnyard: Implications of Genetically Engineered Animals*, organized by the Pew Initiative on Food and Biotechnology.

I've also been working with Carolyn Komar in the Animal Science Department at ISU on activities focusing on ethical concerns about the use of animals in agriculture, and with Denise Schwab in 4-H to develop an activity about ethics for young people doing 4-H animal projects. I'll make these available on our website (http://www.biotech.iastate.edu/Bioethics.html) as soon as they are reviewed, tested, and approved!

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**Biotechnology Workshops**

Jay Staker, Mike Zeller, and I have organized a November workshop focusing on agricultural biotechnology. I'll be giving two presentations, one on bioethics in extension, and one on the ethics of human stem cell research (see story on p. 2).

Work continues on organizing an all-bioethics workshop for summer 2003. Watch for that announcement early next year, and plan to come join us!

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**From Classroom to Career**

**Biotech Career Day October 23**

The fourth annual Biotechnology Career Day for high school and college students will be held at Iowa State University on Wednesday, October 23.

Students can learn about jobs and internships in the biotechnology industry by visiting informational display booths staffed by company representatives. The displays will be located in the Molecular Biology Building atrium from 9:00 a.m. to 3:00 p.m. There is no cost for students to attend.

The event is sponsored by the Iowa Biotechnology Association and the ISU Office of Biotechnology. For more information, contact Lisa Lorenzen at 515-294-0926, e-mail lorenze@iastate.edu, or visit the web site at http://www.biotech.iastate.edu/Industrial_resources/career_day2002/.

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Glenda D. Webber

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DNA Dining at Farm Progress Show

Visitors at the Farm Progress Show, a national event held this year on September 24-26 near Alleman, IA, had the chance to extract DNA from bananas and sample banana smoothies at a display developed by Iowa State’s Office of Biotechnology and ISU Extension’s Science, Engineering, and Technology (E-SET) program.

Jay Staker, E-SET program director; Mike Zeller, biotechnology outreach education coordinator; and other ISU Extension personnel helped visitors see that DNA is in all food, whether it has been genetically engineered or not.

Participants extracted white, stringy-appearing DNA from a piece of banana using common household supplies such as salt, shampoo, and rubbing alcohol. Visitors were treated to a smoothie drink made of bananas, strawberries, tofu, honey, and orange juice to help them make the connection that DNA is, and always has been, in any food we eat. Surveys have shown that many people believe that only genetically engineered food contains DNA.

National DNA Day Is April 25

The National Human Genome Research Institute (NHGRI) invites teachers and students to join in celebrating National DNA Day on April 25, 2003. That date marks the 50th anniversary of the description of the double helix structure of DNA by James Watson and Francis Crick and the expected completion of the sequencing of the human genome in 2003.

The NHGRI is offering teaching tools to help commemorate these science landmarks, including a video cast of James Watson and the NHGRI director discussing human genetics to be done April 15, an online multimedia tool called Exploring Our Molecular Selves (http://www.genome.gov/Education/), and a web and printed curriculum supplement titled Human Genetic Variation (http://science-education.nih.gov/Customer.nsf/HSGlobal).
*Alea 3*
Morris Green, Emmetsburg High School, 2nd and King, Emmetsburg, IA 50536, school phone 712-852-2966, school fax 712-852-3317, e-mail mgreen@emmetsburg.k12.ia.us

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Diane Den Herder, Sioux Center Community High, 550 9th Street NE, Sioux Center, IA 51250, school phone 712-722-2981, school fax 712-722-2986, e-mail diane.denherder@sioux-center.k12.ia.us

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*Alea 15*
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*Alea 16*
Ernest Schiller, Central Lee High School, Highway #218 South, Donnellson, IA 52625, school phone 319-835-5121, school fax 319-835-5709, e-mail eschiller@central-lee.k12.ia.us

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**Educational Opportunities**

For K-12 resources, click on Education.

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**Grants/Competitions**

**Ames Lab/ISU Science Bowl**

Iowa high school students can test their knowledge in the 2003 Ames Laboratory/Iowa State University Science Bowl scheduled for January 25 in Ames. The winning team receives an all-expenses-paid trip to the National Science Bowl® in Washington, D.C., to compete against other regional winners. For more information, contact Cynthia Feller at 515-294-9557, or e-mail her at feller@ameslab.gov

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**Grants, Awards, and Competitions**

For detailed rules and eligibility requirements, use the contacts in the “for more information” sections.

**Craftsman/NSTA Young Inventors Awards Program**

**Sponsor:** Sears, Roebuck and Co.

**Funds for:** Using creativity, imagination, science, technology, and mechanical ability to invent or modify a tool

**Amount:** Two national winners each receive $10,000 U.S. series EE savings bonds. Ten national finalists receive $5,000 U.S. series EE savings bonds. Twelve second-place regional winners receive $500 U.S. series EE savings bonds. Twelve third-place regional winners receive $250 U.S. series EE savings bonds. Additional prizes for winning teachers and schools. Certificates of appreciation and small gifts for all students who submit completed entries.

**Who's eligible:** Students in grades 2-8 in the U.S. and its territories

**For more information:** Phone toll-free 888-494-4994, e-mail younginventors@nsta.org, web site http://www.nsta.org/programs/craftsman

**Deadline:** Received by March 4, 2003

**Toshiba Grants Program for 7-12 Science and Math Education**

**Sponsor:** Toshiba America Foundation

**Funds for:** Programs, projects, and activities that improve classroom teaching and learning of science, mathematics, and the science and mathematics of technology

**Amount:** Average large project $9,500, average small project $4,000

**Who's eligible:** Teachers of grades 7-12

**For more information:** Phone 212-596-0620, e-mail foundation@tai.toshiba.com, web site www.taf.toshiba.com

**Deadline:** Year-round for requests under $5,000. February 1 or August 1 for requests over $5,000.

**Toyota TAPESTRY**

**Sponsor:** Toyota Motor Sales, USA, Inc.

**Administered by:** NSTA
**Link Up with Biotech on the Internet**

With each year, the number of online biotechnology resources for educators keeps growing. There are more lesson plans, background information documents, hands-on animations, and interactive simulations available than ever before. The ISU Office of Biotechnology brings these to educators’ attention through this newsletter and an annotated list of web sites that we add to throughout the year at http://www.biotech.iastate.edu/publications/ed_resources/Web_sites.html. If you see a web site that you think other educators should know about, please contact us.

**Office of Biotechnology Web Site**

The newly redesigned homepage of the ISU Office of Biotechnology at http://www.biotech.iastate.edu has education, bioethics, research, and industrial resources. Among the resources for educators are classroom lab activities, step-by-step illustrated tutorials for selected lab activities in html and PowerPoint®, information about the ISU Biotechnology Outreach Education Center, bioethics case studies, biotechnology-related ISU courses and seminars, educational funding resources, sources of equipment and supplies, resource people, current and archived copies of the Iowa Biotech Educator and other newsletters and news releases, the Research in Biotechnology faculty directory, information about careers in biotechnology, and links to other web sites.

**ISU Extension Web Sites**

Found at http://www.extension.iastate.edu, the ISU Extension web site has many resources that can be used by educators. Science activities, curricula, workshops, issues investigations, and links to other sites can be found at the Extension Science, Engineering, and Technology (E-SET) site at http://www.extension.iastate.edu/e-set/. Information about biotech crops and several PowerPoint® presentations can be found at the Iowa Grain Quality Initiative site at http://www.extension.iastate.edu/Pages/grain/.

**USDA Consortium Grant Web Site**

In the fall of 2000, the U.S. Department of Agriculture awarded a $3.7 million grant to a consortium of nine land-grant institutions in Minnesota, North Dakota, South Dakota, Iowa, and Wisconsin. During the four years of the grant, the institutions and producer, government, consumer, environmental, public interest, and industry organizations are addressing the economic, ethical, and social aspects of agricultural biotechnology. The web sites of the participating institutions have papers and presentations that may be useful to educators. These web sites all can be accessed from http://www.biotech.iastate.edu/publications/IFAFS/default.html.

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**Toshiba/NSTA ExploraVision Awards**

**Sponsor:** Toshiba  
**Administered by:** NSTA  
**Funds for:** Student teams who create a vision of a technology of the future using research, writing, computer skills, artistic skills, and applied knowledge of science and technology  
**Amount:** Four 1st place teams receive $10,000 U.S. series EE savings bonds and four 2nd place teams receive $5,000 U.S. EE savings bonds (Canadian teams receive Canada bonds). Other gifts awarded at all levels.  
**Who’s eligible:** K-12 students in U.S. or Canada  
**For more information:** Phone 1-800-EXPLOR-9 or 703-243-7100, e-mail exploravision@nsta.org, web site www.toshiba.com/tai/exploravision/.  
**Deadline:** Received by 5 p.m. EST, February 4, 2003

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**Library of Crop Technology**

http://croptechnology.unl.edu/

This web site hosted by the University of Nebraska has lessons, animation downloads, and Spanish translations for topics in crop technology such as plant biochemistry, crop genetics, and crop genetic engineering. The high school portion of the site has lessons in DNA extraction, gene cloning, gene design, transformation, plant breeding, and more. In the nutrition section are lesson modules on basic biotechnology, consumer concerns and allergenicity, practice applications, and nutrient composition.

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**Article Explores Cloning**

http://www.faseb.org/opar/cloning/

The article “Cloning: Past, Present, and the Exciting Future” by Marie A. Di Berardino is from the Breakthroughs in Biotechnology series of the Federation of American Societies for Experimental Biology. The article gives an overview of cloning and discusses the advantages and disadvantages. It includes illustrations of the basic biological mechanisms.
About the ISU Public Education Program in Biotechnology...

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