

# PREPARING COLORADO'S FUTURE BIOSCIENTISTS



BY DOUG MCPHERSON

**T**oday Alysha Dihle is exploring epigenetic interactions and alternative splicing.

A few weeks back she was studying molecular genetics and inheritance patterns. Next week she'll be examining the effects of mutations in DNA on protein synthesis and making possible correlations to diseases.

Dihle is not a scientist at a biotech firm, forensics expert or physician.

The 17-year-old high school student is doing all those high-tech maneuvers in her Biotech I class at Castle View High School in Castle Rock.

Not your father's high school—by a long shot.

The school offers the Cadillac of biotechnology education, where students kick the tires of biotech, test drive it as a possible career—taking forensic science, genetic counseling, cancer research and bioinformatics for a spin.

What's more, CVHS gives math, language arts, social studies and art a biotech touch. In math the focus is on statistics; in social studies students learn the history of how biotechnology became an industry; and in language arts, they write scientific papers.

"I've learned so much," Dihle says. "It's given me a great foundation to better understand the life sciences."

## TEENAGE RESEARCHERS

Brenda Dempsey, the biotechnology coordinator at CVHS, calls the school a special place and says students are "fascinated with the genome, human or otherwise, and all that genomes tell us.

"Our purpose is to build student interest in biotechnology and biotech-related career fields," she says. "Students are immersed in



the process of science as they analyze the latest research, perform in-depth experiments, and discuss the bioethics and implications of the technology.”

CVHS now offers two classes in biotechnology; a third is on the way next year.

Biotech at CVHS offers “relevant and rigorous” real-world connections, Dempsey says. “Courses are taught in the present tense.

They’re learning new concepts and emerging technology...in molecular biotechnology. And they’re able to see the connections to the real world.”

At CVHS teenagers tackle topics most scientists don’t get to study until college or grad school: molecular genetics and inheritance patterns; protein synthesis and structure; gene-gene and gene-environment interactions;

genomewide linkage; transgenic organisms and cell-signaling pathways, cancer genetics and stem-cell properties. They use bioinformatics software for gene hunting, designing primers, predicting protein-folding patterns and looking at genotype distributions across population data sets.

Students have the opportunity examine different cellular types of cancers, examining tumor slides of real patients (with these patients remaining anonymous), learning about disease in a molecular context and looking for target areas where new drugs might be effective.

Each year students visit Long Island, N.Y.-based Cold Spring Harbor Laboratory, home of James Watson, the American molecular biologist best known as one of the co-discoverers of the structure of DNA. There they work in the lab’s Dolan DNA Learning Center performing DNA experiments using their own DNA. “It is an inspiring experience,” Dempsey says.

Thirty-five miles north of CVHS, there’s another inspiring scene at Lakewood-based Bear Creek High School. That’s where Ashley Cavanaugh, 17, is taking Process Technology I, a course where students earn college credits through Red Rocks Community College.

In the lab-based class students handle everything from blood typing to urinalysis to gram staining bacteria.

“The class is awesome,” Cavanaugh says. “It’s challenging in a fun way. We’re getting to use the hands-on experience that the professionals use. It’s really cool.”

For their final project students diagnose possible illnesses in samples of fake urine, blood and bacteria using techniques

**CRB**  
25 years  
1984 - 2009

**LABORATORY  
BIOTECH  
AND PHARMACEUTICAL  
FACILITIES  
SOLUTIONS**

11101 West 120th Avenue  
Suite 130  
Broomfield, CO 80021  
303-993-1820  
www.crbusa.com www.crbuilders.com

Boston Boulder Kalamazoo Kansas City Philadelphia Raleigh  
St. Louis San Diego San Jose San Juan

CONSULTING ■ DESIGN ■ CONSTRUCTION ■ COMMISSIONING ■ QUALIFICATION



they've learned during the class.

Next year a Process Tech II class is on tap.

### REAL SCIENCE

In biology classes at BCHS, students are isolating DNA from wheat cells, running PCR (polymerase chain reaction) on their own DNA, and performing bacterial transformations to create glowing bacteria.

Students do Internet research related to the latest cancer, cloning and stem-cell research, followed by class discussions, says Tamra Miaja, a biology teacher at BCHS.

"We look at jobs in bioscience, too," she says. "I hope to open their eyes to the myriad of possibilities that exist after college." Students are enthusiastic about the lab work. One shouted out recently, "I actually feel like a real scientist," Miaja reports.

### RAISING THE BAR

Despite such shouts, there's room for improvement in science education.

The National Association of Educational Progress, a group that issues national reports cards on school performance, found in 2005 that 34 percent of Colorado's eighth graders fell into the "below basic" understanding of science, while 62 percent had either a basic or proficient understanding of science. The rest were considered advanced.

Colorado's scores are slightly above the national average, where roughly 41 percent scored "below basic," 59 percent at or above the basic level.

U.S. science education needs to become "more inquiry-oriented" so students can "learn


how to think scientifically," says Susan M. Buhr, director of Cooperative Institute for Research in Environmental Sciences (CIRES) at the University of Colorado at Boulder.

Buhr is not alone. Numerous sources, including the National Science Education Standards established by the National Research Council in 1996, agree that inquiry-based learning needs to be beefed up.

The good news for Colorado is that help for K-12 science teachers is available. The Biological Sciences Initiative, a program offered by CU-Boulder, now offers workshops and tuition-free graduate courses for teachers.

Both Miaja and Dempsey hold out hope for students.

"I believe the most important thing students are learning is critical thinking. That's what will allow them to succeed," Miaja says. "If I can instill a passion for scientific curiosity ... then hopefully they'll take that with them into their careers."

Back in Castle Rock, Dihle reflects on the future: "We can bring a lot of passion to ... biotechnology. We realize the potential for the future ... and we'd like to be the ones to reach that potential of what can be done next." 

# QUALITY CARE



**Your locally owned leader in health care is a national role model for excellence.**

Poudre Valley Health System has received the 2008 Malcolm Baldrige National Quality Award – the highest Presidential honor given to United States businesses and organizations that demonstrate performance excellence.

Thank you to our treasured patients and families, incredible volunteers, staff and physicians, and the many regional organizations who support us in achieving our vision to provide world-class health care.

*We're here for you.*

**POUDRE VALLEY HEALTH SYSTEM**



POUDRE VALLEY HOSPITAL • FORT COLLINS, COLORADO | MEDICAL CENTER OF THE ROCKIES • LOVELAND, COLORADO

[pvhs.org](http://pvhs.org)