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The signals move almost imperceptibly from senders to receivers in just milliseconds, delivering orders to speed up production, slow down or maintain current levels of activity. The process isn’t a factory’s method of managing production, it’s the communication going on among cells in plants and mammals — including many cells in your body.

Biologist Daryll DeWald and members of the research team he heads are working to decipher how the cryptic messages of a family of molecules called phosphoinositides regulate some very important activities in cells. The answers may help researchers understand a surprising variety of things about the inner workings of cells, ranging from how plants react to various stresses to how some cancers are able to spread.

Currently, with support from the UAES and the American Cancer Society, DeWald and colleagues Hiroko Hama at Utah State, Glenn Prestwich at the University of Utah and Jeremy Thorner at University of California-Berkeley are focusing their intellectual energy and microscopes on how phosphoinositides regulate the amount of protein cells secrete and how the proteins move around, a process called protein trafficking.

“We’ve found that one of the key regulators controlling protein trafficking in cells is a lipid kinase enzyme, PI4-kinase,” DeWald said. “If its activity is blocked, or you knock out that enzyme, proteins cannot move to various sites inside and outside the cell, and the cell dies.”
Hama deciphered that information about the role of PI4-kinase by studying it in bakers' yeast, *Saccharomyces cerevisiae*. And though yeast and humans don't seem to be very much alike, the protein trafficking going on in our cells is probably not very different. Yeast is also a good model for the study because its cells are compartmentalized, much like our own, and the entire *Saccharomyces cerevisiae* genome has been sequenced, giving scientists important information about its inner workings. Protein secretion and trafficking are critical for cell survival, but in cancer cells — especially some breast, ovarian, and uterine cancers — levels of protein secretion are much higher than they are in normal, healthy cells.
"In some cancers protein secretion is altered — apparently, up-regulated," DeWald said. "PI4-kinase activity in these cells can be as much as 50-fold higher than in noncancer cells."

It's what some of those proteins do that may allow cancers to spread, a process called metastasis.

"Mammalian cells in tissues are held together by an extracellular matrix," DeWald explained. "The cells are stuck together because they secrete things that help form the matrix that is not really part of the cells per se, but is part of the tissue. They need the matrix to keep them ordered and communicating with each other."

The team has demonstrated in yeast how protein secretion is controlled and think the mechanism will be the same in mammalian cells. Some of the proteins cells secrete are capable of moving outside the cells, digesting the matrix that binds them and releasing cells from the tissue. It could be that in cancer cells with very high levels of protein secretion the matrix connecting the cells gets dissolved, allowing the cancerous cells to spread.

If that proves to be the case, learning to control protein secretion and trafficking could be a key to keeping cancers from spreading.

"We hope the information gained from our studies will uncover molecular sites that are suitable as targets for novel anticancer drugs," DeWald said. "That will be a long way down the road. The American Cancer Society and the
Experiment Station fund research for a lot of applied science, but also recognize opportunities to solve important problems even when they require some very basic research. My colleagues and I are very grateful because these are basic questions of science we're trying to answer." LH

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One of Daryll DeWald's students is featured in our student profile on page 23.
Despite all those milk-mustached celebrities in the “Got Milk?” ads, soft drinks seem to be winning the beverage popularity contest against milk.

Fluid milk consumption among youth aged 11-18 years has decreased 40 percent over the last 20 years, and soft drink consumption has nearly tripled. One of the biggest concerns over that trend is how calcium consumption and subsequent bone health is being affected. To better understand these concerns, we need more information about which foods kids eat to get their calcium and how much they are consuming. In particular, very little is known about the calcium intake habits of non-Caucasian youth. That information will help define strategies to increase calcium intake among youth in the United States and build healthy bones.

Adolescents +

Deborah R. Gustafson, a USU nutrition scientist, and colleagues from nine other western states are creating better tools to measure calcium intake and identify what motivates and what inhibits adolescents of various ethnic backgrounds in their choices about consuming milk and other dairy products. The researchers are focusing on youth in two age groups, 11-12 and 16-17 years, who are Caucasian, Asian and Hispanic.

“Declines in calcium intake occur most dramatically between the ages of 11 and 19 years,” she says. “Dairy foods are major sources of calcium, a nutrient that is essential for protection against osteoporosis, and potentially against other chronic diseases including colon cancer and hypertension.”
Nationally, there is great interest in measuring dietary and health behavior patterns of youth in relationship to their current and future health, she says. It’s important information because young people’s decisions about what and when to eat influence their health during adolescence and also set patterns that may put them at greater risk for diseases of later life, such as heart disease and certain cancers.

There are very few dietary surveys available for measuring intakes of American youth, particularly youth of various ethnic backgrounds, Gustafson says. The goal of this project is to formulate a computerized dietary survey that uses pictures of foods to measure calcium intake. This survey is designed for youth ages 10-18 years and will be used to accurately and reliably assess intake of dairy foods and nutrients important to bone health among Caucasian, Hispanic, and Asian youth in Utah and the western United States. This new software will also be used in another recently funded project to promote healthy calcium intake patterns among multiethnic youth using a nutrition education intervention program.

The projects are sponsored by U.S. Department of Agriculture and State of Utah Mineral Lease grants. Nutrition doctoral students Keith Jensen and SiewSun Wong will compile data from these projects, and are designing the computer-based dietary survey for youth, which should be completed by Spring 2002. DH

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The Utah Agricultural Experiment Station
USU PROFESSOR NAMED EDITOR OF JOURNAL

Keith Mott, professor of Biology at Utah State University, has been named chief editor of the journal Plant, Cell and Environment.

The monthly journal, based in Oxford, England, is internationally recognized as one of the leading journals in plant biology. As editor-in-chief, Mott will oversee the scientific direction and quality of the research published, mediate disputes between reviewers and authors, and appoint the editorial board composed of scientists from around the world.

The publication reviews and publishes current research on all aspects of plant science related to the environment and is considered one of the premier vehicles for plant physiology research. Among the measures of a journal's importance to the scientific community are how many papers it selects for publication and how frequently the articles are cited by other researchers. Plant, Cell and Environment accepts just 35 percent of the papers submitted and its articles are cited an average of 3.5 times, making it one of the most competitive and frequently referenced journals in the field.

"It is a great honor and career highlight to be selected for this chief editor position considering the hundreds of other top scientists that could have been selected," Mott said.

The UAES supports a portion of Mott's research into responses of plant leaf stomata — microscopic openings on the surface of leaves — to environmental changes and stresses.

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HINKAMP JOINS EXPERIMENT STATION

Dennis Hinkamp has joined the Utah Agricultural Experiment Station's information staff. Hinkamp is a native of Missouri with a BS and MS in Journalism from the University of Missouri. He has written for various university publications including Utah State University Magazine since 1980. He recently served as visiting science writer for the Oregon State University Extension and Experiment Station Communications office. He is the recipient of a Agricultural Communicators in Education Writing Excellence award, and is regularly invited to participate in national and regional writing groups reporting on Extension/Experiment Station activities.

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Nutrition and Food Sciences reports that education on diet and medication management for people with diabetes can help reduce the incidence and cost of hospitalization. After surveying 102 diabetic patients, researchers found that special diet education provided on an outpatient basis can prevent or postpone complications from the disease that affects 6 percent or 15.7 million people in the United States. Diet and self-management techniques that were taught by a dietitian proved to be effective in improving insulin levels regardless of gender, age, type of diabetes, and level of education. Patients in the study were receiving ongoing medical care by their physician in addition to nutrition education by the dietitian.

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Utah State University researchers Yoon Lee, Jeanette Arbuthnot, Barbara Rowe, Marion Bentley, and Goog-Soog Hong have been named winners of the Northeastern Regional Agricultural Experiment Station Directors Research Award for Excellence. The USU researchers are part of a larger national team of Experiment Station researchers at 15 universities studying family-owned and home-based businesses for the past 13 years.

The group has examined in detail not only the economic impact of family businesses but also the relationships among the family, the business, and the community. They have developed Extension materials for business owners, their families, and policy makers and produced numerous academic publications on family functioning, management, and business viability. The focus of the project is to quantify the economic and social contributions of family businesses to their local, state, and national economies and communities.

“These businesses are vital to Utah’s economy and communities,” Rowe says. “Family-owned and home-based businesses hire people in their communities, they pay taxes on their income, they purchase goods and services from their immediate neighbor’s businesses, and they allow people who are already established in a community to remain in that community when they might otherwise have to move to follow other employment. They also fill a range of market niches within local economies.”

The project, Family Business Viability in Economically Vulnerable Communities, received this award from the northeast regional research directors. The award is from the Northeast district because that is where the project originated 13 years ago.

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Recent Grants and Contracts

Richard Koenig investigates spacial distribution induced by manure spreading and its relationship to soluble phosphorous in soils. His research is funded by the USDA/NRCS.

Deborah Gustafson, in collaboration with researchers at Purdue University, studies improving bone health in adolescents through targeted behavioral intervention.

Next Proteins International funds research conducted by Marie Walsh on comparisons of ingredient sources on the production of textured whey protein burgers.

Improving pastoral risk management on East African rangelands is the focus of work conducted by Layne Coppock, in collaboration with researchers at the University of California-Davis.

Jeff Hall investigates the potential bioavailability and toxicity of the iron in processed organic fertilizers.

In collaboration with researchers at Washington State University, John Evans conducts studies on management practices to control jointed goatgrass in winter wheat.

DeeVon Bailey investigates the economic feasibility of a soybean crushing facility in Utah with funding from the Utah Department of Agriculture and Food.

Adoption and the well being of adolescents is the focus of research conducted by Brent Miller, with funding from the U.S. Department of Health and Human Services and the National Institutes of Health.

Research conducted by Don Jensen and the Utah Climate Center staff is supported by the Sevier River Water Resource Management Network.

Albion Labs supports research conducted by Deloy Hendricks on regulating the fate of zinc amino acid chelate in rats.

Faculty on the Move

Professor Gong-Soog Hong is head of the Human Environments Department. Her research interest is consumer economics. She earned a bachelor's degree in pharmacy and a master's degree in public health from Ewha Women's University in Seoul, South Korea. She received a master's degree in household economics from USU and a doctoral degree in consumer economics from Cornell University.

The Animal, Dairy and Veterinary Sciences Department added new faculty member Ryan Mass to its ranks.

Mass is assistant professor of dairy cattle nutrition. He earned a bachelor's degree in animal science at Iowa State University and completed master's and doctoral degrees at University of Nebraska-Lincoln. His research interest is forage and protein utilization by ruminants.

Daniel Hubert is assistant professor in Agricultural Systems Technology and Education. His research interests are agricultural safety and health education, technology education and evaluation and assessment. He earned a bachelor's degree in range and wildlands science and his
secondary education certification at University of California-Davis. He received master's and doctoral degrees in agricultural education at Oklahoma State University.

Kelly Kopp is assistant professor in the Plants, Soils and Biometeorology Department and Extension specialist for water conservation and turfgrass science. She earned a bachelor's degree studying renewable natural resources at Texas A&M University. Her master's and doctoral degrees are in hydrology and agronomy from the University of Connecticut.

**Administrators on the Move**

With a calendar full of meetings with administrators — including a new university president — department heads, students, law makers and state agriculture leaders, Donald Snyder has barely managed to find time to unpack the boxes of books and papers that accompanied him to dean's office in Utah State's College of Agriculture.

Snyder became interim dean in January, serving in that position while Dean Rodney Brown temporarily fills a joint post in Washington, D.C. with the National Aeronautics and Space Administration and the United States Department of Agriculture, bringing NASA technology to agriculture and presenting agricultural questions to NASA.

"For example, soil types, moisture levels, insect populations and locations, and many other conditions on Earth can be analyzed from space," Brown said. "This and much more information needs to be put into forms that farmers and ranchers can use to improve their operations.

NASA has a lot of data that can be of value to farmers and ranchers, but they struggle to get it to them. My job is to help them link up, allowing NASA to get the most out of their satellites while helping America's farms and ranches become more productive and efficient."

Snyder, a professor of economics, served as head of Utah State's Economics Department from 1989-96, is a member of the Governor's Agribusiness Council and former chair of the Western Agricultural Economics Council.

"Utah State University's College of Agriculture has a long tradition of helping to provide a safe and secure food and fiber system to U.S. and international consumers," Snyder said. "I am delighted to work with the excellent scientists and support staff of this college as we continue to teach our students and conduct research that benefits people in Utah and beyond."
The combination of drought conditions, a finite supply of water and a growing population is prompting pleas for more efficient water use throughout the state. Ask water resource managers and researchers and they'll tell you that Utahns, in general, have a knack for overwatering. Perhaps we come by it honestly, a remnant of the time when pioneers settled this high desert and the choice was between irrigation and starvation.

Fewer Utahns now irrigate to sustain life, but many irrigate to sustain a lifestyle that includes green lawns and lush gardens. But calls to conserve water often leave those who irrigate home landscapes and those who irrigate field crops asking the same question: How much water is enough water?

The Utah Climate Center has created a new online tool to help people in all parts of Utah answer that question by showing them just how much water the soil in their area has lost in the past week and how much water needs to be replaced through irrigation or rainfall.

Each weekday the Utah Climate Center staff updates an online, color-coded map of the state created using data on the temperatures, precipitation and wind recorded at between 50 and 90 of the Center's
An example of the new online maps created by the Utah Climate Center. Data from each automated station from around the state is averaged for the preceding seven days to create each new edition of the map. The top map shows how much water has been lost through evapotranspiration. The bottom map shows how much water is needed for replacement, taking into account other factors such as rainfall.

weather stations scattered throughout Utah. Users see by color and by number an average of how much water has been lost from their soils and plants in the preceding seven days. A blue patch at your spot on the map means the soil has enough or even a surplus of water, while a dark orange area means turn on the sprinklers! The map does not take soil types into account, but still provides a good way to gauge how much water to apply, said Utah Climate Center Director Don Jensen.

Data from each automated station is averaged for the preceding seven days to create each new edition of the map because daily readings would fluctuate too widely to provide a good assessment of what's going on in the soil, Jensen said.

The new web-based tool includes a forecast for the next several days to help users anticipate precipitation that may reduce the need to irrigate. Users also find a table accompanying the map where they can look up their city, or a neighboring one, by name and see how much water to apply that week.

The map can be viewed at http://climate.usu.edu and through links from the Utah Agricultural Experiment Station (http://www.agx.usu.edu) or Utah State Extension Web sites (http://www.ext.usu.edu).

"This map really puts our data to good use to help people in the state use water more efficiently," Jensen said. "We will keep the information updated daily and hope this Web site will get a lot of use this summer."
Kelly Kopp, Utah State Extension water and turfgrass specialist, said the new map will be an important part of helping people use water more efficiently. She teaches people to think of soils as places that need a proper balance of water and air in order to support healthy plants. Applying too much water is not just wasteful, it also makes turf and other plants more susceptible to pests and diseases, she said.

Kopp urges people caring for home landscapes to contact the Extension office in their county to get a simple, plastic gauge (see page 24) that will help them measure how much water is being applied along with tips on how to irrigate more efficiently.

“Very often people don’t really know how much water they apply with their sprinklers,” Kopp said. “Another problem is that people with automatic sprinkling systems program them at the beginning of the season and they water all spring, summer, and fall without adjusting the settings. Your lawn doesn’t need as much water in the spring and fall so it isn’t efficient to use as much water in June as you do in August.”

Kopp said information that accompanies the water gauge helps people determine how to best program their sprinklers or time the use of other irrigation methods.

Beyond helping people determine water needs for home landscapes, Jensen adds that the Climate Center’s online map is also a useful tool for agencies that must monitor areas for public safety reasons, such as dry areas that are susceptible to wildland fires and wet areas that become havens for breeding mosquitoes. LH

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New President for USU

Utah State University's 14th president is a newcomer to Utah, but a veteran of the land grant university system and philosophy. Kermit L. Hall assumed his administrative duties on January 1 and has rarely sat still since. Hall's early meetings with faculty, staff, and students in all eight colleges and visits to other campus facilities, including the Biotechnology Center, helped prepare the new president for his role as an advocate of Utah State's people and programs during the legislative session.

Hall told legislators, "I see Utah State University rising alongside Iowa State, North Carolina State, Virginia Tech, Purdue and Washington State -- all land grant universities with a strong history in engineering, science, technology, teacher training, business, agriculture, and natural resources. They are benchmarks Utah State University is capable of reaching. But choices must be made and made now."

Hall emphasized the need to set priorities and make choices that will make Utah State's areas of strength areas of greatness.

"Utah State University has been and will be even more a university of the people of Utah," Hall said. "The opportunity to work with colleagues to set an agenda for increasing excellence and access in the new millennium is a distinct pleasure and a great opportunity."

In an effort to learn more about the people of Utah and the ways in which Utah State serves them, Hall is traveling the state and making good on his promise to "milk a cow in every county."

Utah State's new first lady, Phyllis Hall, is also an educator and most recently served as an elementary school library and media specialist in North Carolina. She recently accepted an invitation to join the Utah Botanical Center Advancement Board.

More information about President Hall, including the schedule for his tour of the state, is available online at the president's page link on the Utah State University home page [www.usu.edu].
Jim Thomas spends a lot of time answering the question "Is it safe?" It's not a question most university administrators have to concern themselves with. Of course, most administrators aren't working in the West Bank — one of the most disputed parcels of land in the world. The short answer is, "Yes, it is safe." But only in the same way being in many of the United States' major cities is safe.

There are some roads you don't take and some borders you don't cross. You carry your passport. You have Israeli license plates so you can go from the West Bank to Israel, but you put a Palestinian flag on your dashboard when you are in Palestinian controlled areas. You wear a baseball cap or a tie to make yourself look more American because the disputes are between the Israelis and the Palestinians. Most of the disputes come when Palestinians throw rocks at the Israeli Defense Forces (IDF) troops and the troops shoot back.

So it is safe if you are Jim Thomas, senior advisor to the president of the Arab American University in Jenin, and you are used to crossing borders in the name of education. Thomas has lived and worked in Bolivia, South Africa, Iran, Egypt and India and has made professional visits to about 25 countries. He is associate dean for international programs in Utah State’s College of Agriculture, and has spent half of his USU career working abroad. He travels on both U.S. and Canadian passports and his current work permit is issued by the IDF.

The West Bank is about 65 miles long and 20 miles wide and home to about two million people. The University is safe because it is built on land that is self-governed by the Palestinians under the 1993 Oslo Accord. The vision is that this land will someday become the country of Palestine. But for now the land is divided. The map of the country...
that Thomas shows at presentations is pock-marked with patches of different colors representing areas of the country that are Palestinian controlled, under dispute or contain Israeli settlements.

The West Bank is a small area of biblical proportions, where old cities are thousands, not just hundreds, of years old. Though the campus is new, the surroundings are old. Old as in ancient. Not far from the campus are the remains of Roman structures.

Despite all the cultural differences, Thomas says the Arab American University-Jenin will eventually look and feel much like a land grant university in the United States.

"That's why the group of Palestinian investors in this private university approached me four years ago," he says. "They wanted someone with land grant and international agricultural experience to help build a university that teaches courses in English so its graduates can be more competitive in the world economy."

USU was given a half-million dollar research and development grant issued through the Agency for International Development (AID). Most of the funding will help establish the university's academic programs through consultants, visiting professors and professors on sabbatical. By next year, Thomas expects 400 more students in addition to the 300 attending now, and within 10 years the university should be complete and will serve an area with about 250,000 people.

The university's initial degree programs are designed to meet current needs of people in the area — arts and sciences, administrative and financial sciences, allied health sciences and dentistry.

"Because medicine is such an esteemed profession among Palestinians, there are many doctors in the area but not many health support professionals such as nurses, paramedics, and hospital administrators," Thomas says. "There is also a shortage of dentists. Colleges of law, agriculture, engineering, pharmacy, information technology, and veterinary medicine will follow."

The university’s first four buildings are complete and the campus is starting to take shape on 10 acres of rocky knoll. The university’s 300
Palestinian and Arab-Israeli students completed their first semester in December 2000.

"The students are great except that they are all freshmen, and like freshmen anywhere in the world, they like to play a little too much," he says.

An all-freshman student body is not the only unusual thing about this university. The work-week is Saturday through Wednesday.

"We use Friday as the Sabbath because that is the day Muslims use all over the world. In some countries the 'other' weekend day is Thursday and in some places it is Saturday. Here is it Thursday, so our 'weekend' is Thursday and Friday. We do have problems working around the various Sabbath days. Muslims have Friday, Jews have Saturday along with the Seventh Day Adventists, and Christians who use Sunday," Thomas says.

Thomas and his wife Marilyn live in Zebabdeh, a town of 2,500 people just a mile from campus. His neighbors pass on the legend that Zebabdeh, is "two donkey days from Nazareth" — referring to stories from biblical times that Mary and Joseph stopped here on their way to Bethlehem.

The most recent Intifada (an Arabic word translated roughly as awakening, insurrection, shudder or uprising) has cut tourism to the area by 95 percent.

"It's too bad," Thomas says, "Because you could go to spectacular historic sights every weekend for years while you live here."

You'd think that after all the globe hopping, Thomas might want to settle down. But that seems unlikely.

"I'm already 65 so I could retire right now, but I have promised to stay here for three more semesters," Thomas says. "My last child graduates from USU in May. After that we will probably continue to travel and find places to help and give service. Maybe South Africa, maybe South America."

For Utah State's Jim Thomas, the world really is his campus. DH

Website: http://www.aauj.edu
A terrorist posing as a food service worker blends easily into the clattering activity in a large kitchen where each mealtime means feeding hundreds or thousands of people. He quietly goes about adding *Salmonella* to salad ingredients that are subsequently eaten by unsuspecting: a) soldiers, b) Olympic officials and athletes, c) embassy personnel, d) fill-in the blank with any group that might attract the attention of terrorists looking to gain media attention for their cause, disrupt an event or compromise the strength of the military.

It's not a far-fetched plot from a spy novel, and it's just one scenario Robert Micelli, adjunct faculty member in Nutrition and Food Sciences and a biochemist with Defense Group, Inc.'s operations at Dugway Proving Grounds, studies with collaborators Bart Weimer and Marie Walsh.

Micelli discussed bioterrorism in a guest lecture at USU's Biotechnology Center, describing some of the threats that could be aimed at people and the environment, including agricultural targets, and some of the ways bioterrorism might be battled with biotechnology.

"Bioterrorism has many faces," he said. "It may be state sponsored or carried out by a small group or an individual. The motives may be ideological, religious or political, and the goal could be to disrupt a public event and get attention, to gain economic power or to cause mass casualties."
USDA knows economic motives could prompt a biological attack aimed at agriculture, Micelli said, and considers several agents to be possible weapons: rice blast, capable of causing 60% crop losses; stem rust, a fungal disease of cereal crops; Aspergilus, a threat to poultry production; and hoof and mouth disease. Among the biological agents considered threats to humans are anthrax, smallpox, plague, Giardia, encephalitis viruses and foodborne pathogens such as Salmonella, Shigella, Listeria, and E.coli 0157:H7.

While bioterrorism is regarded as a worldwide threat, local interest in the topic has intensified as security preparations for the 2002 Winter Olympic Games in Salt Lake City point out that welcoming the world means anticipating that some may view the high-profile, international event as a target for terrorism.

While some research is aimed at identifying how biological agents could be spread and how to clean them up once they are, other important work is focused on detecting them in air, water, soil, and food. That’s where the expertise and technology in USU’s Center for Microbe Detection and Physiology (CMSP) come into play.

Weimer and Walsh co-direct the center and collaborated with Micelli and others at Dugway in a program to test concepts and a wide array of equipment meant to restore normal operations to a military base following a biological or chemical attack. The project included evaluating and developing methods of protecting people, sensitive equipment and the environment, and tools to use following an attack. Researchers tested technologies for sensing pathogens, methods of containing contamination, and tools for decontaminating skin, equipment and the environment. In all, the Dugway group and its collaborators tested 60 existing technologies in just six months and conducted a mock field

It is a threat with many components that the military and other agencies are exploring, and it poses a variety of complex problems. For example, intelligence work can provide some information about where biological weapons are produced and by whom. But unlike nuclear weapons that require carefully regulated components and large manufacturing facilities, Weimer said biological weapons could be created by “any competent microbiologist” in a kitchen doubling as a laboratory, using ingredients obtained at a landfill.
exercise at an air base in Korea. In the end, 15 of the 60 technologies passed the test.

Among the technologies tested were rapid microbe detection systems developed at the CMDP, one of which is now licensed for commercial production for use in food processing plants.

"What we have developed at the center are new methods to detect microbes in near real time," Weimer said. "That has a lot of important applications because time is critical in the event of a biological attack because you have to be able to identify the microbes before you can treat people and clean up equipment and the environment. It also has huge economic implications for food processors because they currently have to hold food for several days while they wait for test results to tell them whether it is safe to ship."

The CMDP's patented device, dubbed ImmunoFlow, detects the presence of E. coli 0157:H7 in just 15 minutes and the researchers are working on the bio part of the technology to detect Salmonella and Listeria with similar speed and accuracy. To put that in perspective, consider that current tests for those pathogens require between eight and 96 hours. The device — about the size of a laser printer — forces liquified food, like meat samples, through a filter of glass beads coated with antibodies that bind to specific bacteria. Chemicals in the filter fluoresce, making the bacteria visible to the instrument.

The speed of the test is a function of its sensitivity. Other tests require enough time to allow any bacteria in the samples to have multiplied to 1,000 to 10,000 cells. The ImmunoFlow can detect just 10-100 cells in a sample.

"If you have to treat people it is critical to find out as soon as you can what the pathogen is."

Weimer said. "And while you wait for results from other tests the bacteria have been multiplying rapidly."

Weimer said the CMDP's detection work largely focused on creating tools for use in food processing plants and restaurants that would increase food safety and save processors millions of dollars in storage costs. He pointed out that when we eat at restaurants most of us trust that the people there and at processing plants are doing their best to provide us with good, safe
food because if they didn't they would be shut down and suffer huge losses. The military has to look at a darker side of human nature and the deliberate use of pathogens.

Weimer said the scenario of a terrorist tainting food for military personnel is not just hypothetical, it really happened when salad laced with *Salmonella* took its toll on troops in the Middle East just after the Persian Gulf War. Weimer explained that although many food borne pathogens wouldn't kill people, it doesn't take much imagination to see that a military division suffering from a serious bout of food poisoning would not be in any condition to defend itself or others very effectively.

"This isn't just a military issue though," Weimer said. "Bioterrorism and detecting pathogens crosses a lot of disciplines and involves such agencies as the National Institutes of Health, the USDA, and Centers for Disease Control and Prevention in addition to the Department of Defense. We have a Memorandum of Understanding with Dugway and they are promoting great progress in detection science and technology." LH

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Kelly Manabe, a junior from West Jordan majoring in biology, can only reminisce about the times in high school when she skipped classes to paint. Now most of her time is spent in the lab or studying. However, she hasn’t neglected her artistic side, and, as a result, she has become a well-balanced, level-headed student.

Working with Assistant Professor Daryll DeWald, Kelly is studying signaling molecules in mammalian cells that play a part in cell growth. The research Kelly works on is supported by a grant from the American Cancer Society.

“This is an exciting project,” Kelly explained. “Not only will it lay the foundation for cancer research but it extends to all types of cell growth.”

“No one has a cooler job,” she said with conviction. “It’s fun. I go to work every day, pop in a CD and watch live images of cells changing and moving on the computer screen.”

However, the computer Kelly works on is no simple piece of machinery. It is connected to a large confocal microscope which examines specimens with a laser. Kelly is one of the few undergraduate students who use the microscope.

In her work in DeWald’s lab, Kelly delivers phosphoinositides, a specific group of molecules, to cells and then observes how they enter and relocate inside cells.

Kelly is motivated by her desire to learn and likes working in labs because it makes biological complexities a little more comprehensible.

“It’s fundamental to understanding the world,” Kelly said. “It’s one of the main reasons I chose biology as a major. And having an interest in what you’re studying counts more than intellect. Biology is interesting because it involves problem solving. Sometimes studying is a painful process, but it is exciting to apply what you learn and then find a solution to a problem.”

Working in DeWald’s lab has enhanced Kelly’s biology studies and been instrumental to her success at Utah State University.

“Working in the lab, I’ve learned a lot of new things; things I could never learn in class.”

Laboratory experience has also helped Kelly focus on what she wants to do once she finishes her bachelor’s degree.

“I’ve learned what it is like to be a graduate student or professor working in the lab,” she said. “I’ve learned a lot from the graduate students and discovered what I like to do and what I don’t.”

Kelly has worked in several labs — each one creating new experiences and opportunities and opening a lot of doors. With numerous options available, she currently plans to attend graduate school and possibly study bioinformatics.

Kelly said she is not pursuing a career in science simply to discover or achieve. She wants her research to benefit society.

“I want to make the world better, not more complex,” she said. “I think the biology field needs more people like me!”

— Mica McKinney
EDITOR'S FOOTNOTE

At least you've got your health. It's the thing people say to console you when it seems everything else in your life is falling apart. Truth is though, when you don't have your health, not much else matters. It's a cliche that becomes startlingly less trite when you discover that you might not have your health after all.

I'm no poster child for healthy lifestyles — I go to the gym sporadically, my 10-pound free weights are gathering dust under the bed, I have a weakness for Coke and onion rings, and when I run it's usually because I'm chasing my 3-year-old. I suspect though that I'm not alone in thinking (rationalizing) that I'm doing alright if nothing really aches, I don't smoke, don't consider french fries and ketchup the most important members of the fruit and vegetable group, and can climb a few flights of stairs while breathing normally.

When I went for a routine check-up awhile back I didn't expect a gold star from my doctor, but I didn't expect any problems either. Then a letter arrived asking me to make it my “first priority to have additional tests done to help make a definitive diagnosis.” It was just one line in the letter, but a line that quickly makes the phrase “health scare” more meaningful.

I thought about what can happen to people with breast cancer, tried to focus on positive things and called my brother, a cancer survivor, and his wife, a nurse. We talked about all the reasons I'm not a good candidate for breast cancer — no family history, under age 50, under 30 during my first pregnancy — and about the importance of trying not to worry too much until I had more tests.

Still, it became much more important to me that a research team at Utah State, lead by biologist Daryl DeWald, is working to discover how cancers start and spread. My mental Rolodex kept flipping to the American Cancer Society statistics I looked up as background for that story: This year about 182,800 women in the United States will be diagnosed with breast cancer and 40,800 will die from breast cancer; skin cancer is the most common cancer in women, followed by breast cancer, but heart disease is the leading killer of women.

DeWald is careful to point out that his research is very basic and that the process of discovery is slow and methodical. His team's work in the lab may not lead to new ways to block the spread of cancer, but it might. Some may wonder why an Agricultural Experiment Station is involved in cancer research. The short answer is that the work DeWald's group does is so basic that it is helping scientists understand some of the complexities in our cells and even in the cells of other animals and plants.

Other projects the UAES supports investigate how chemical compounds in some foods may help prevent cancer, how new drugs may help fight hepatitis, influenza and other viruses, how nutrition affects the bones of teenagers and senior citizens, and how nutrition during pregnancy may relate to incidence of cleft palate in babies.

We humans are good at focusing on the crisis of the moment, and it seems that nearly everyday since more tests found that I do not have breast cancer I've still been thankful that there are people working long hours and pursuing all kinds of theories in an effort to understand and treat cancer. I suppose antiviral research will gain new importance in my world the next time I get the flu. For now, I'll just try to stay fired up about healthier eating and exercise instead of wishing I could do it retroactively the next time some diagnosis rearranges my priorities.

The Experiment Station's vision statement says our work is about "the science of survival" and "down-to-earth research that has the lofty mandate of improving human life." Improving people's health is crucial if we're going to help improve their lives. So the next time someone tries to cheer you up by reciting, "At least you've got your health," remember, that ain't half bad.

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PHOTOQUIZ

Clue: Something every homeowner should have.

Answer to last issue's photoquiz (below): This is a glassine bag used in crossing wheat and barley. The bag is placed over the wheat head after the anthers have been removed to protect it from foreign pollen.