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A four-wheeled rover, called CaveR, explores and collects data inside a lava cave similar to the ones at Lava Beds National Monument in Northern California.

Is there life on Mars? The clues may be in earthy lava caves

When lava flows down the slope of a volcano, it can leave behind an extreme environment ideal for unusual microbial life. It also can leave behind potential clues to answering the life on Mars question.

Saugata Datta, Kansas State University geology professor, is one of the primary investigators of a NASA study that uses a robotic vehicle to explore and collect data inside lava caves at Lava Beds National Monument in Northern California. Lava cave interiors are home to bacterial films and coral-like mineral structures called mineral biomarkers that could help identify similar features that would provide evidence for extraterrestrial life on Mars or another planet.

A multi-institutional team of scientists and engineers is using \$3.9 million from NASA's Planetary Science and Technology for Analog Research program to support a three-year project in the lava caves. Researchers are using a four-wheeled rover, called CaveR, to explore the earthy lava caves and produce a detailed map of the inside of the caves. The rover collects images to give the scientists information about the chemical makeup of the features on the cave walls.

For the project, Datta's research focuses on the water, rock and soil chemistry in the caves and what it looks like from the rover's perspective when these three elements interact with each other to create the living or once-living material, called biomass.

Shorts



Finding the sweet spot to preserving bacon

Kansas State University researchers are sweet on a recent study in which they found that naturally smoked sugar helps to extend the shelf life of frozen bacon.

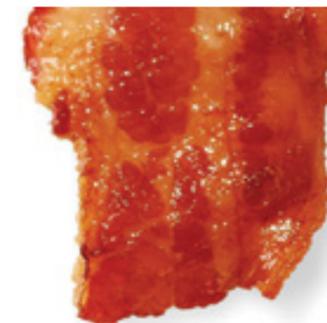
They tested bacon that had been frozen for up to 120 days to find out whether adding an antioxidant in the form of smoked sugar could slow down the rate of oxidation, a natural process that leads to discoloring and an off flavor to the meat.

The answer is clearly yes.

K-State researchers injected smoked sugar during the meat's curing process, packaged and froze the meat for a period of up to 120 days, and then used trained taste panels to verify the quality of the meat.

"It does not seem, unless we use a vacuum package, that we can get flavor shelf life much longer than 40 days on frozen bacon," said Terry Hauser, associate professor of animal sciences and industry and K-State Research and Extension meat specialist. "When we added an antioxidant to these bacon formulations, it really extended our shelf life over the frozen storage period."

Houser said smoked sugar adds another flavor profile that he thinks consumers also will like. He noted that many compounds can be used as antioxidants, but this study was specific to smoked sugar.



Healthy horses: Veterinary Health Center begins offering equine stem cell therapy

The Veterinary Health Center at Kansas State University is now offering regenerative medicine therapy, including platelet-rich plasma and animal stem cell therapies, for equine patients.

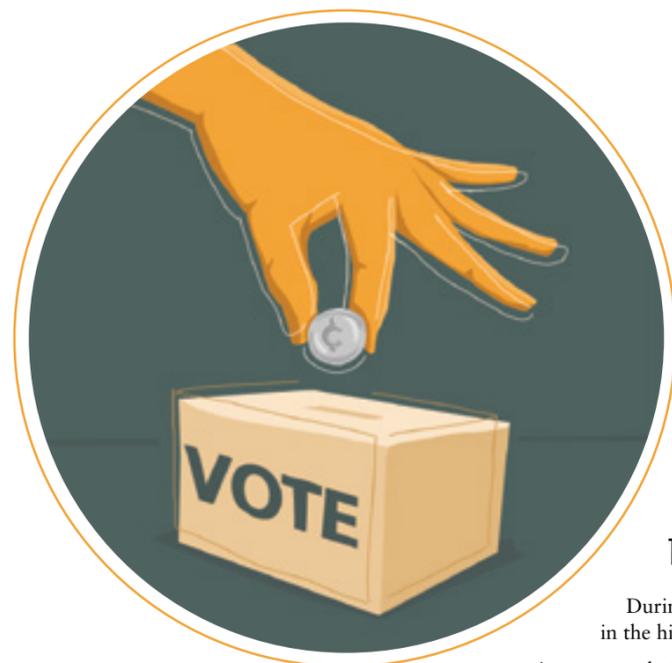
The animal stem cell therapy could benefit horses with osteoarthritis, tendon injuries and ligament tears.

Just like in humans, animal stem cells are the precursors of normal tissue cells. They are found throughout the animal's body and often are enriched in the bone marrow and fat.

Studies have shown that animal stem cell therapy is safe and has the potential to effectively treat multiple acute and chronic inflammatory diseases. Platelet-rich plasma uses the effects of concentrated growth factors, released from the platelets, to enhance the healing process.

The Veterinary Health Center is working with Enso Discoveries, a regenerative medicine company based in Manhattan, Kansas. Chanran Ganta, a stem cell researcher and veterinary pathologist at the Kansas State Veterinary Diagnostic Laboratory, collaborated with Enso Discoveries.

Stem cells collected from patients at the Veterinary Health Center can be processed at Enso Discoveries' Manhattan laboratory and used in a patient within the same day.



Political matchmaking: How campaigns find the best donors

During an election year, political candidates are involved in the high-cost endeavor of finding new donors.

A recent study from two Kansas State University College of Business Administration researchers aims to understand how political campaigns pursue donations.

It all comes down to data, say researchers Doug Walker and Edward Nowlin, both associate professors of marketing. Political campaigns allocate financial resources to collect and analyze data to get to know prospective donors and to solicit the best matches. A campaign can better target donors by collecting more data, but the campaign is limited by what it can afford.

Walker and Nowlin recently published “Data-Driven Precision and Selectiveness in Political Campaign Fundraising” in the *Journal of Political Marketing*.

In their study, the researchers found that when a campaign expected a large donation size, it should spend more on donor data to increase precision and be less selective on who is targeted. In addition, increases in solicitation costs suggested campaigns should be more selective in targeting potential donors.

Walker and Nowlin’s analysis is consistent with federal campaign reports from the 2016 presidential election. During that election, the Clinton campaign received larger donations on average and, as predicted, spent more money on data, while the Trump campaign had more smaller donations and spent less.

“The donation size and the cost of solicitation drives how campaigns should go about targeting,” Walker said. “Both groups did that based on the money available to the campaigns. They both did what they had to do under the conditions they experienced.”



Cracking the wheat code

Kansas State University scientists have created a genetic road map for wheat, which is a breakthrough that will bring stronger wheat varieties to farmers.

University scientists, in collaboration with the International Wheat Genome Sequencing Consortium, recently published a detailed description of the complete genome of bread wheat, the world’s most widely cultivated crop, in the journal *Science*. The cover article is titled “Shifting the limits in wheat research and breeding using a fully annotated reference genome.”

This work paves the way for the production of wheat varieties better adapted to climate challenges, with higher yields, enhanced nutritional quality and improved sustainability.

The research article was authored by more than 200 scientists from 73 research institutions in 20 countries and presents the reference genome of the bread wheat variety Chinese Spring. The DNA sequence ordered along the 21 wheat chromosomes is the highest-quality genome sequence produced to date for wheat. It is the result of 13 years of collaborative international research and the support of the National Science Foundation, the U.S. Department of Agriculture National Institute of Food and Agriculture, Kansas farmers and many others.

“It is a dream come true for Kansas wheat farmers, who were the first to invest in the wheat genome sequencing project and were pivotal in rallying U.S. wheat farmers in support of the wheat genome sequencing project,” said Bikram Gill, university distinguished professor emeritus of plant pathology who organized the first workshop on wheat genome sequencing in 2003.

With the genome sequence now completed, breeders have new tools to address global challenges. They will be able to more rapidly identify genes and regulatory elements underlying complex agronomic traits such as yield, grain quality, resistance to fungal diseases and tolerance to physical stress. They also can produce hardier wheat varieties.

Wheat center receives economic engagement award

Kansas State University has recognized the Wheat Genetics Resource Center Industry/University Cooperative Research Center with an Excellence in Innovation and Economic Engagement Award.

The award recognizes exemplary economic engagement in talent, innovation and place. The honor was modeled on the Association for Public and Land-Grant Universities Innovation and Economic Prosperity University designation, which K-State achieved in July 2017.

Peter Dorhout, vice president for research, said the award was designed to enhance recognition for economic engagement activities.

“The Wheat Genetics Resource Center brings industry and university researchers and resources together to mobilize genetic diversity, enhance wheat yields and meet growing global food demand,” Dorhout said.

Notable center achievements have included releasing germplasm that is resistant to wheat streak mosaic virus, which caused \$76.8 million in direct losses to Kansas wheat farmers in 2017 alone; a patentable technology to bring genetics from ancient ancestors into modern wheat; and nearly \$10 million in research funding, including proprietary and infrastructure projects. See page 22 for more on wheat research at Kansas State University.

Will Zorrilla, the center’s managing director, accepted the award at the May 16 Research Showcase at the K-State Olathe campus.

