

NASA builds menu for planned Mars mission in 2030s

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HOUSTON (AP) -- Through a labyrinth of hallways deep inside a 1950s-era building that has housed research that dates back to the origins of U.S. space travel, a group of scientists in white coats is stirring, mixing, measuring, brushing and, most important, tasting the end result of their cooking.

Their mission: Build a menu for a planned journey to Mars in the 2030s.

The menu must sustain a group of six to eight astronauts, keep them healthy and happy and also offer a broad array of food. That's no simple feat considering it will likely take six months to get to the Red Planet, astronauts will have to stay there 18 months and then it will take another six months to return to Earth. Imagine having to shop for a family's three-year supply of groceries all at once and having enough meals planned in advance for that length of time.

"Mars is different just because it's so far away," said Maya Cooper, senior research scientist with Lockheed Martin who is leading the efforts to build the menu. "We don't have the option to send a vehicle every six months and send more food as we do for International Space Station."

Astronauts who travel to the space station have a wide variety of food available to them, some 100 or so different options, in fact. But it is all pre-prepared and freeze-dried with a shelf life of at least two years. And while astronauts make up a panel that tastes the food and gives it a final OK on Earth before it blasts off, the lack of gravity means smell - and taste - is impaired. So the food is bland.

On Mars though, there is a little gravity, allowing NASA to consider significant changes to the current space menu. That's where Cooper's team comes in. Travel to Mars opens the possibility that astronauts can do things like chop vegetables and do a little cooking of their own. Even though pressure levels are different than on Earth, scientists think it will be possible to boil water with a pressure cooker too.

One option Cooper and her staff are considering is having the astronauts care for a "Martian greenhouse." They would have a variety of fruits and vegetables - from carrots to bell peppers - in a hydroponic solution, meaning they would be planted in mineral-laced water instead of soil. The astronauts would care for their garden and then use those ingredients, combined with others, such as nuts and spices brought from Earth, to prepare their meals.

"That menu is favorable because it allows the astronauts to actually have live plants that are growing, you have optimum nutrient delivery with fresh fruits and vegetables, and it actually allows them to have freedom of choice when they're

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actually cooking the menus because the food isn't already pre-prepared into a particular recipe," Cooper said.

The top priority is to ensure that the astronauts get the proper amount of nutrients, calories and minerals to maintain their physical health and performance for the life of the mission, Cooper said.

The menu must also ensure the psychological health of the astronauts, Cooper explained, noting studies have shown that eating certain foods - such as meatloaf and mashed potatoes or turkey on Thanksgiving - improve people's mood and give them satisfaction. That "link to home" will be key to astronauts on the Mars mission, and there are currently two academic studies looking further into the connection between mood and food. Lacking certain vitamins or minerals can also harm the brain, she said.

Already, Cooper's team of three has come up with about 100 recipes, all vegetarian because the astronauts will not have dairy or meat products available. It isn't possible to preserve those products long enough to take to Mars - and bringing a cow on the mission is not an option, Cooper jokes.

To ensure the vegetarian diet packs the right amount of protein, the researchers are designing a variety of dishes that include tofu and nuts, including a Thai pizza that has no cheese but is covered with carrots, red peppers, mushrooms, scallions, peanuts and a homemade sauce that has a spicy kick.

To keep this menu going, and get the most out of any research about food sustainability on Mars, Cooper says it's possible NASA will choose to have one astronaut solely dedicated to preparing the food - the Emeril of the Mars mission.

Still, since it remains unclear how much time mission planners will want to spend on food preparation, Cooper is also building an alternate pre-packaged menu, similar to how things are done for crews that do six-month stints on the International Space Station. For this option, though, the food will need to have a five-year shelf life compared with the two years available now. NASA, the Department of Defense and a variety of other agencies are researching ways to make that possible, Cooper said.

The ideal, though, would be to combine the two options.

"So they would have some fresh crop and some food that we would send from Earth," Cooper said.

One of the biggest obstacles, at the moment, may be the budgetary constraints. President Barack Obama's budget proposal in February canceled a joint US-European robotic mission to Mars in 2016, and the rest of NASA's budget has also been chopped.

At the moment, Michele Perchonok, advanced food technology project scientist at NASA, said about \$1 million on average is spent annually on researching and

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building the Mars menu. NASA's overall budget in 2012 is more than \$17 billion. She is hopeful that as the mission gets closer - about 10 to 15 years before launch - that the budget will grow, allowing for more in-depth, conclusive research.

The mission is important: It will give scientists the chance for unique research on everything from looking for other life forms and for the origin of life on Earth to the effects of partial gravity on bone loss. It also will let food scientists examine the question of sustainability. "How do we sustain the crew, 100 percent recycling of everything for that two and a half years?" Perchonok said.

But first things first: None of this will happen without food.

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