

SOUTHWESTERN NEWS

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UT SOUTHWESTERN RECEIVES GRANT TO STUDY LOWERING RISKS FOR BONE LOSS, KIDNEY STONES DURING SPACE MISSIONS

DALLAS – March 21, 2001 – The next major project for the National Aeronautics and Space Administration is the Mission to Mars.

Although some people may still think of this frontier of space exploration as simply science fiction, it may become a reality based on the results of newly funded research projects that include a bone-loss, kidney-stone study at UT Southwestern Medical Center at Dallas.

The National Space Biomedical Research Institute in Houston recently funded 86 projects nationwide that included a three-year, \$456,000 grant to evaluate the effectiveness of a drug, which was developed by UT Southwestern researchers, as a potential countermeasure to the adverse effects of weightlessness on both kidney-stone formation and bone loss.

The team of investigators will include Dr. Joseph Zerwekh, professor of internal medicine and principal investigator; Dr. Charles Pak, chief of the Division of Mineral Metabolism; Dr. Peter Antich, professor of radiology, and Dr. Lisa Wuermser, assistant professor in physical medicine and rehabilitation.

“To overcome the challenges of a long-term space mission, we must have effective countermeasures in place that can prevent or lessen the negative impact exerted by microgravity on normal physiological processes,” said Zerwekh.

“A Mars mission would last no fewer than 2 ½ years. It would take approximately six months to travel there, six months to travel back, and a year and a half on Mars, waiting for the proper cyclical orbit so that the shuttle could return,” Zerwekh said.

Previous studies from Gemini, Apollo, the space station, and shuttle missions have clearly pointed to an increased risk for kidney-stone formation, as well as bone loss, for astronauts in a weightlessness environment.

Zerwekh said a number of changes occur in the composition of the urine that increase the risk for stone formation. Both urinary calcium and phosphorus increase, due to increased bone destruction and, thereby, make the urine more concentrated with respect to these stone forming salts. In addition, there are metabolic changes that result in

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a more acidic urine being excreted that contains less citrate, a potent inhibitor of kidney-stone precipitation and growth. All of these observed changes significantly increase the risk for kidney-stone formation, he said.

Researchers will look at the effects of Relyte, a formulation of potassium-magnesium citrate, to see whether or not taking it reduces the risk of kidney-stone formation. Relyte is in the clinical trials phase of the Food and Drug Administration's approval process, and is a product that was developed by Pak's team of researchers.

Previous studies have also documented a significant loss of bone mineral during space flight and during prolonged immobilization on Earth. An increase in the acid content of the diet contributes to the bone loss, and diets consumed by astronauts during space missions tend to be acidic in nature. The use of Relyte, which would increase alkali intake, may reduce the acid-mediated loss of bone mineral in addition to its effect in reducing kidney-stone formation, Zerwekh said.

Researchers will examine 20 normal subjects at total bed rest for five weeks, an Earth-based model that mimics the skeletal unloading, or weightlessness, encountered in space.

Volunteers will not be allowed to get out of bed or to sit up but will be allowed to prop themselves up on one arm to eat or read. Zerwekh said one-half of the subjects will receive Relyte, and the remaining half will serve as the placebo control. Patients will maintain a regimented diet prior to the collection of urine and blood samples for determination of stone-risk factors and the extent of skeletal bone-mineral loss. They will also receive an ultrasound bone scan to determine whether or not their bones are weakening.

Once the five-week in-patient portion of the study is completed, participants will undergo outpatient monitoring for two additional weeks.

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