How is a clean environment making astronauts sick?

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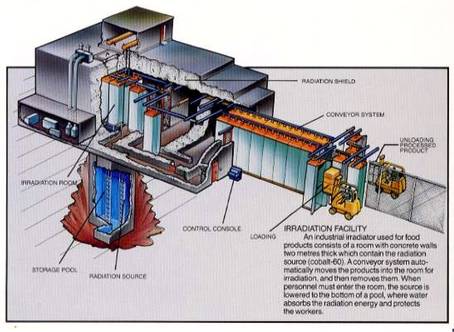
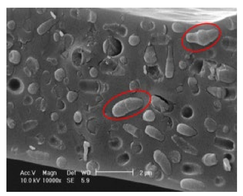
ABSTRACT

Are astronauts deprived of bacteria? The irradiation process used to prepare astronaut food wipes out all harmful bacteria- as well as all beneficial bacteria found in their food. The stress of space travel can decrease the quality of GI bacteria due to low gravity, radiation, and a contained sterile environment. Is it important for astronauts to be eating probiotics?



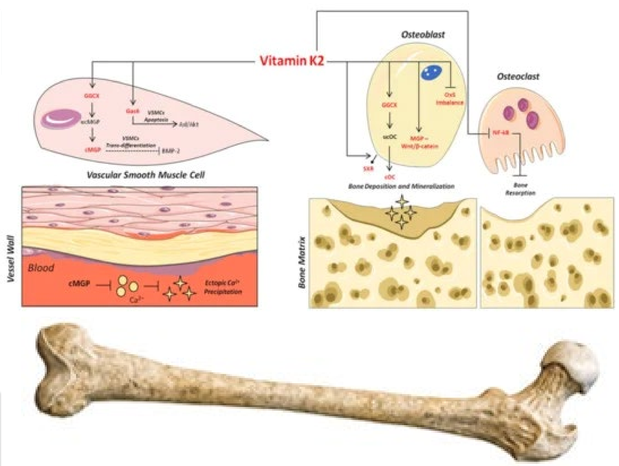
OBJECTIVES

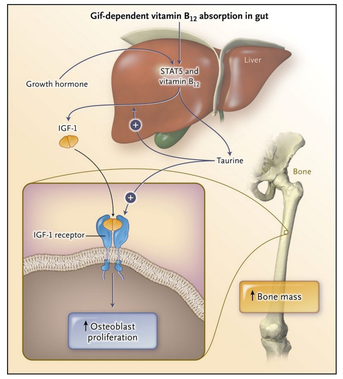
I want to find how to encapsulate probiotics in which astronauts can effectively supplement with in outer space. Can we freeze dry Lactobacillus strains of probiotics? Probiotic products are currently banned in space travel due to risks they pose.



BACKGROUND & OVERVIEW

Lactobacillus is a probiotic which produces vitamin K in the large intestine. Vitamin K deficiency is correlated with lower bone mineral density and increased fractures. This bacteria can often survive the freeze drying process, but not very well. I would like to study ways to protect the bacteria's viability throughout freeze drying. Vitamin B12 is also produced by lactobacillus, increasing osteoblast activity increasing bone mass. Astronauts are known to have decreased bone health due to low gravity, and new research is showing that gut bacteria may be a factor of this phenomena.





METHODS & MATERIALS

Select lactobacillus strain and obtain for testing.

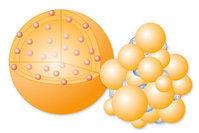
Freeze dry bacteria & test viability.

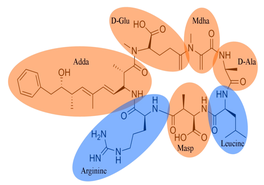
Test effects of aminos and acid protectants on viability.

Conclude the most effective ways to preserve probiotic viability through out the freeze drying process.

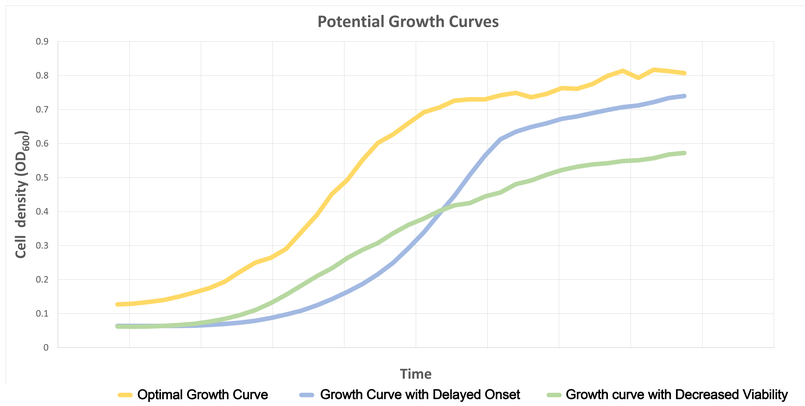
What's next?

- Test for the best method of encapsulation
- Viability of bacteria in the GI tract based on encapsulation method
- Increase purity and safety of probiotic to be administered during space travel.



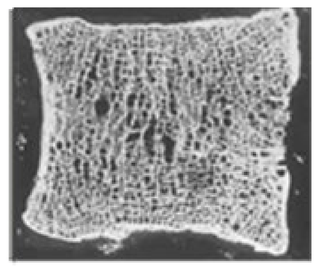


PROJECTED RESULTS

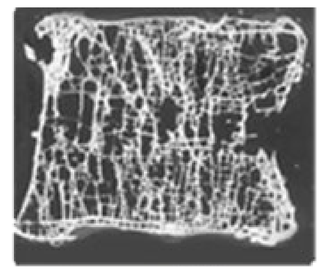


WHAT NEXT?

Once there are more viable ways to protect Lactobacillus probiotic strains while freeze dying, future tests can find the best method of administration to ensure this bacteria can survive in the GI tract. Females have an increased risk for bone density diseases, this research can further research other factors increasing this risk- like gut health or vitamin deficiency.



Normal Bone



Osteoporotic Bone

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