Osteoporosis Canada
Ostéoporose Canada
COPING
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Remember: You can live well with osteoporosis!

Astronauts and Osteoporosis: What's the Connection?

In this issue

Fracture Fact:

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1. What Happens to Bones in Space?

One of the major obstacles to long-term space missions is the threat of severe bone loss in astronauts. In the microgravity environment of space, astronauts lose on average 1% to 2% of their bone mineral density every month. For a short-duration flight, bone loss is a fairly minor consequence.

On a long-duration space flight, such as those planned for missions to Mars and beyond, bone loss can be a serious impediment. This loss may not hinder astronauts while they are in orbit, but upon return to Earth, their weakened bones will be fragile and at an increased risk of fractures. At this time, it is unknown whether this bone loss will eventually reach a plateau, or whether it will continue indefinitely.

Bones are not unchanging calcium structures; they constantly reshape themselves in relation to the stress that is put on them. Just like muscles, if you don't use your bones, they will weaken. Bone loss occurs in the weightless environment of space because bones no longer have to support the body against gravity. On Earth, gravity applies a constant mechanical load to the skeletal system that causes healthy bones to maintain a certain density so that they are able to support the body.

The best way to build bone mass is by doing weight-bearing exercises such as walking, jogging, volleyball, and basketball. However, it is very difficult to duplicate weight-bearing exercise in a weightless environment. Astronauts must use restraints to strap themselves to a treadmill in order to create the necessary weight-bearing environment. Although this countermeasure slows the rate of bone loss, it does not eliminate the problem altogether.

Astronauts are not the only ones who must worry about bone loss. One and a half million Canadians suffer from osteoporosis, a disease that causes bones to lose density and strength. One in four women and one in eight men over the age of 50 have osteoporosis. Researchers hope that solving the problem of bone loss in space will also help to prevent and cure the disease on Earth.

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2. Canadian Space Research: Getting down to the bone with eOSTEO

Gravity has a profound effect on bone tissue. For example, fish have thinner bones than land creatures because the water environment supports their weight.

Over a long period in space, bones become weaker. "Bone cells are not stimulated anymore by the body weight and they start absorbing bone tissue, releasing minerals in the bloodstream. Bones that usually support the body have thinner walls and reduced density, so bone loss is more important in legs and hip than in the arms. In fact, the only arm that does not lose any bone in space is the Canadarm!" jokes Nicole Buckley, Director of Life and Physical Science at the Canadian Space Agency (CSA).

"In space, astronauts can lose up to 10 percent of their bone mass in three months," says Lowell Misener, Project Manager at Systems Technologies, which is similar to advanced osteoporosis on Earth, a condition that affects about 1.4 million Canadians. "But without gravity, bone loss is 10 times faster. And healthy astronauts are not immune to these effects. Space provides us with an accelerated environment for studying bone disease, particularly bone loss."

The e-OSTEO mission uses an automated mini-lab to carry out bone cell research in microgravity. (Photo: © Canadian Space Agency)

After 90 days in space, some of the bone tissue that's lost will not regenerate once the astronaut returns to Earth. "A trip to Mars could result in serious fractures," Misener points out.

The CSA has teamed up with industrial and academia partners to design, build and operate a fully automated mini space laboratory to study bone loss in the unique conditions of microgravity, more specifically, to help scientists better understand the bone loss processes. Known as eOSTEO, the hardware was developed by Millenium Biologix Inc. and Systems Technologies, and Orion Canada supported preparations for launch. Academia partners include the University of Toronto and McGill University. eOSTEO is also supported by the Canadian Institutes of Health Research.

Made-in-Canada automatic space experiment

eOSTEO will provide the international research community with the right conditions for bone cells to grow in microgravity. Slated for launch on September 14, 2007, two eOSTEO systems will orbit Earth for 12 days aboard a Russian satellite. One houses the Canadian experiments, while the other contains experiments from European scientists. Meanwhile, the same experiments are being conducted on the ground so scientists can compare bone cell growth in space with what happens in the presence of gravity. Canadian ground stations in St-Hubert, Quebec, and Saskatoon, Saskatchewan, will also help download data from the satellite.

The three Canadian experiments study:

- how bone cells in microgravity react to signals that increase and decrease bone formation; this research is led by Dr.Reginald Gorczynski of the University Health Network in Toronto (associated with University of Toronto)

- whether microgravity compromises bone cell architecture; Dr. Rene Harrison of the University of Toronto will lead this experiment

- whether a hormone that promotes bone creation can, in weightless conditions, prevent the death of cells that build bone. Dr. Andrew Karaplis of McGill University will investigate this phenomenon.

International space research with long-term benefits

Research into the causes of bone loss in space may lead to a better understanding of osteoporosis and other diseases on Earth, and advance the search for countermeasures or possibly even cures. The e-OSTEO experiment is an enhanced version of OSTEO, a similar study performed in the shuttle in 1998. Astronauts, including veteran NASA astronaut John Glenn, carried out the experimental tasks. With the skills and knowledge they gained, Millenium Biologix and Systems Technologies developed the automated tissue engineering system. "Every aspect of the tissue engineering system was developed first through OSTEO, in a more simplified way," says Lowell Misener.

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If you have questions about this article or any other aspect of osteoporosis, please call toll-free 1-800-463-6842 (416-696-2663 in the Greater Toronto Area) to speak to an information counsellor.

Coping Going Green

If you know someone who receives Coping every three months in hard copy, please share this message with them.

Most of our COPN members receive the newsletter by email; however, some of you still enjoy a paper copy. However, as the costs of printing and postage continue to spiral, we have made the responsible decision to provide *Coping* by a more environmentally friendly option only – **by email**. (Did you know over 13 ounces of water are used to produce one sheet of paper?) This change will be effective May 31, 2016 and it will help us reduce not only costs but also paper use.

These are the benefits to this change for our COPN members:

1. You can change the font size on your desktop, laptop or tablet to read the newsletter in a font that is best for you.
2. You will receive timely announcements about medication updates, rapid responses to media reports, etc. every two weeks rather than every three months.
3. You can easily share an email with your friends and family.
4. You can watch seminars online on leading edge bone health topics from experts while in the comfort of your own home.
5. You have the option to print out a copy of *Coping* and save it, share it and discuss it with others.

Action you need to take to move to email will be explained in our April and May issues of *Coping*. For those of

you new to Internet and email, perhaps a family member, friend or neighbour can guide you step-by-step and help you provide the required information so that you receive *Coping* by email and continue to access online the wealth of knowledge *Coping* has to offer!

BONE MATTERS: Getting the Most from Your Healthcare Appointment

Originally aired: Tuesday, February 16, 2016

Did you miss our recent live *Bone Matters* presentation featuring information how to make your healthcare appointments work for you? Andrea Martin and Darren Robbins of the Self-Management Program at the South West Community Care Access Centre shared their tips and advice on how to prepare for appoinments, communicate effectively with your doctor, and other things to consider to help you be involved in your treatment. Click here to watch the archive presentation.

Did you watch this presentation? Tell us about your thoughts and experiences here.

Too Fit to Fracture: User Survey

Osteoporosis Canada launched the *Too Fit to Fracture* initiative in June 2014 to promote new recommendations on exercise for people with osteoporosis. Over the last year and a half, we have worked with experts to develop tools to help you exercise in a way that is safe and helpful. Now we want to hear from you to get a sense of what you found useful and what you did not so that we can develop better tools in the future. Please take a few moments to complete our brief survey online at:

https://www.surveymonkey.com/r/9KWQKNF

FUNNY BONE:

Always use tasteful words. You may have to eat them later.

A Recipe from our Sponsor

Breakfast au Gratin

Course: *Main Dishes*
Preparation Time: *10 mins*
Cooking Time: *15 mins*
Yields: *4 servings*

3/4 milk product serving(s) per person

Calcium: 32% DV/ 352 mg

Ingredients

1 tbsp (15 mL) **butter**
8 thin slices of baguette
4 eggs
4 slices of **Canadian Raclette cheese**
1 cup (250 mL) vegetables of your choice (onions, mushrooms, peppers, zucchini, etc.), diced

Tips

Cheese alternative: Canadian Camembert.

Originating in Switzerland – where a traditional meal of raclette includes cold cuts, potatoes and a host of condiments – Raclette is a cheese designed specifically for melting. We love tradition, but couldn't resist sharing these novel ways to enjoy Canadian Raclette's distinct unctuosity.

For more information about this recipe:
http://www.dairygoodness.ca/getenough/recipes/breakfast-au-gratin

Preparation

Raclette grill method
Heat raclette grill to medium-high. Heat 4 pans under the grill.

Melt ½ tsp (2 mL) butter in each pan. Break an egg into each pan and top with cheese. Cook for 4–5 minutes or until desired doneness.

Meanwhile, melt remaining butter on the grill. Cook vegetables and grill baguette slices.

Place 2 baguette slices topped with 1 egg and cheese on each of 4 plates. Add grilled vegetables and serve.

Oven method
Preheat oven to 425°F (220°C).

Butter 4 gratin dishes and place 2 baguette slices in each dish. Break an egg into each dish and top with cheese.

Cook for 7–10 minutes or until desired doneness. Melt some butter in a skillet on medium heat and cook vegetables.

Remove gratin dishes from the oven and top with vegetables; serve.

Cooked, crumbled bacon can be sprinkled on top just before serving, if desired.

This issue of COPING is sponsored by Dairy Farmers of Canada

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