

# Human research study explores effects of hot yoga

21 November 2017, by Diana Lachance And Jennifer Statham

**Calcium Lost Through Sweat: Is There Evidence of Bone Remodeling Due to Cutaneous Calcium Loss during Bikram Hot Yoga?**  
Shannon L. Mathis<sup>1</sup>, Hasan Alrefai<sup>2</sup>, Carmeladell J. Watkins<sup>3</sup>, Gordon G. MacGregor<sup>2</sup>  
<sup>1</sup>Department of Kinesiology and <sup>2</sup>Department of Biological Sciences, <sup>3</sup>Bikram Hot Yoga Huntsville

---

**Abstract**

It has been hypothesized that sweating from high-intensity exercise causes a disruption of calcium homeostasis leading to bone resorption and bone mineral density (BMD) loss. The purpose of this study was to separate the effect of exercise and the effect of heat on calcium homeostasis and bone resorption. Participants were measured before and after a Bikram hot yoga session. **RESULTS:** Participants were females aged 47.4 ± 5.1 years. Mean calcium loss was 1.35 ± 0.25 mg (0.03 ± 0.01 g) per session. Mean BMD was 0.88 ± 0.02 g/cm<sup>3</sup>. Mean calcium loss was 1.35 ± 0.25 mg (0.03 ± 0.01 g) per session. Mean BMD was 0.88 ± 0.02 g/cm<sup>3</sup>. Mean calcium loss was 1.35 ± 0.25 mg (0.03 ± 0.01 g) per session. Mean BMD was 0.88 ± 0.02 g/cm<sup>3</sup>. Mean calcium loss was 1.35 ± 0.25 mg (0.03 ± 0.01 g) per session. Mean BMD was 0.88 ± 0.02 g/cm<sup>3</sup>.

**Purpose**

The purpose of this study was to measure the relationship between cutaneous calcium loss and bone resorption in premenopausal women participating in Bikram hot yoga. This will allow us to determine whether this activity is bone resorption response by measuring changes in PTH, a biochemical marker of bone resorption.

**Results**

A fractional body water compartment calculation was used to determine if changes could be explained by a decrease in plasma volume. The fractional extracellular fluid compartment (ECF) concentrations in relation to the observed calcium loss and calcium loss in sweat was 1.12 ± 0.17 mg/kg. This is not different from the observed measurement 1.22 ± 0.76 mg/kg or 1.23 kg/10% to higher than the observed measurement. Participants were measured before and after a Bikram hot yoga session. Mean calcium loss was 1.35 ± 0.25 mg (0.03 ± 0.01 g) per session. Mean BMD was 0.88 ± 0.02 g/cm<sup>3</sup>. Mean calcium loss was 1.35 ± 0.25 mg (0.03 ± 0.01 g) per session. Mean BMD was 0.88 ± 0.02 g/cm<sup>3</sup>.

---

**Background**

- Bikram Yoga is a sequence of 26 hot yoga postures and five breathing exercises performed at 105° F and 40% humidity for 90 min (Fig. 1).
- Exercise in a hot and humid environment causes a large loss of calcium in sweat.
- It is hypothesized that sweating from high-intensity exercise causes a disruption of calcium homeostasis leading to bone resorption and bone mineral density (BMD) loss.
- PTX also causes the kidneys and the gastrointestinal tract to reduce mean calcium levels.
- The reduction in calcium homeostasis may lead to bone resorption and ultimately bone loss.
- Participants were measured before and after a Bikram hot yoga session.
- Mean calcium loss was 1.35 ± 0.25 mg (0.03 ± 0.01 g) per session. Mean BMD was 0.88 ± 0.02 g/cm<sup>3</sup>.
- Mean calcium loss was 1.35 ± 0.25 mg (0.03 ± 0.01 g) per session. Mean BMD was 0.88 ± 0.02 g/cm<sup>3</sup>.

**Methods**

Participants were female (n=8) with a mean age of 47.4 (SD = 5.1) years who completed research presented here at a Bikram hot yoga session in Bikram Hot Yoga Huntsville, AL. Subjects with kidney disease, who use any medications known to affect bone metabolism, and who use blood thinners were excluded from the study.

**Study measurements**

- Bone density (DEXA) (Body Scan)
- Fluid intake (Diagrams) (Body Scan)
- Sweat was collected using a 500 ml sweat cap (Bikram No. 3, GE Healthcare Bio-Sciences) covered against the thigh during the Bikram hot yoga session.
- Blood samples were collected pre and post 90-min Bikram hot yoga session.

Serum and sweat calcium concentrations were measured using a Calcium Colorimetric Assay Kit (Cayman) (Bio-Sciences) from Molecular Probes, Inc. Serum sodium was measured using a colorimetric sodium assay (Cayman No. 12774-B) (Bio-Sciences) from Molecular Probes, Inc. Serum PTH was measured using a radioimmunoassay (Cayman No. 12774-B) (Bio-Sciences) from Molecular Probes, Inc. Serum PTHrP was measured using a radioimmunoassay (Cayman No. 12774-B) (Bio-Sciences) from Molecular Probes, Inc. Serum PTHrP was measured using a radioimmunoassay (Cayman No. 12774-B) (Bio-Sciences) from Molecular Probes, Inc. Serum PTHrP was measured using a radioimmunoassay (Cayman No. 12774-B) (Bio-Sciences) from Molecular Probes, Inc.

---

**Conclusions**

- There is no evidence that sweat loss during Bikram Yoga stimulates bone loss.
- Bikram yoga appears to be a safe practice for premenopausal women.
- Calcium loss in sweat is a small fraction of the total calcium loss and is not a significant contributor to bone loss.
- It is recommended that fluid, sodium, and potassium be replenished after hot yoga practice.

Indeed, as an assistant professor in the Department of Kinesiology, Dr. Mathis brought not only a Ph.D. in health and human performance to the partnership, but also a strong research background on the topic of bone mineral density (BMD); her dissertation, entitled "Osteogenic Effect of Endurance Cycling," investigated the factors that contribute to low BMD in male competitive cyclists.

From that study, Dr. Mathis had established that sweating during high-intensity exercise causes a disruption in [calcium homeostasis](#) leading to bone resorption and low BMD in endurance athletes. But was the same true of people who practice hot yoga? To find out, she and Dr. MacGregor decided to focus on one specific group already at risk for calcium loss but among whom the practice has become an increasingly popular form of exercise – premenopausal women.

"We know that exercise in a hot and humid environment causes a large loss of calcium in sweat, and that premenopausal women already show an average loss of 0.25-1 percent annually due to hormonal changes that alter [calcium levels](#)," says Dr. Mathis, who received a 2017/2018 New Faculty Award earlier this month. "What we wanted to find out was whether additional losses of calcium in sweat caused by multiple sessions of hot yoga per week would further decrease their BMD and increase the risk for bone fractures."

Funded with a cross-college faculty research award from the university for \$5,000 and in partnership with Carmeladell Watkins, owner of Bikram Hot Yoga Huntsville, they enlisted eight premenopausal women with a mean age of 47.4 years who had practiced hot yoga for about two years. "We measured their nude body weight, fluid intake, and blood samples before and after a session of Bikram yoga, which consisted of performing 26 postures in 90 minutes at 105°F and 40 percent humidity," says Dr. MacGregor. "We asked participants to press chromatography paper against the thighs to

The pair presented their findings at the American College of Sports Medicine's annual meeting this past spring. Credit: University of Alabama in Huntsville

Bikram yoga, the most commonly practiced type of hot yoga, offers practitioners a vigorous workout in a studio kept at 100°F or more. But is working out that much heat good for you? That's what Dr. Shannon Mathis and Dr. Gordon MacGregor, two professors at The University of Alabama in Huntsville (UAH), decided to find out with a cross-college research project entitled "Calcium Lost Through Sweat: Is There Evidence of Bone Remodeling Due to Cutaneous Calcium Loss during Bikram Hot Yoga?"

As a regular practitioner, it was Dr. MacGregor's yoga practice that first got him thinking about the study. "When you do hot yoga, you sweat a lot, and I wanted to know exactly what was lost in that sweat," says the assistant professor of biological sciences. "Then Shannon joined the faculty, and she is an expert on calcium, [bone](#) loss and exercise."

1 / 3

collect sweat after the final yoga pose, while participants were still inside the studio."

Provided by University of Alabama in Huntsville

By taking measurements both before and after, they were then able to determine the amount of cutaneous calcium lost through sweating and to use the blood collected to measure both the total calcium and levels of serum parathyroid hormone (PTH), a biochemical marker of bone remodeling.

As Dr. Mathis explains, PTH is released by the parathyroid glands when they detect a decrease in calcium, stimulating osteoclasts to break down bones and release calcium back into the extracellular fluid compartment. It also causes the kidneys and the gastrointestinal tract to reabsorb more calcium, resulting in what's known as a disruption in calcium homeostasis, which in turn can lead to bone resorption and ultimately low BMD.

What they found, however, surprised them both. "Our original idea was that people were going to be sweating out a lot of calcium and their bones would start to break down for the body to maintain its calcium levels," says Dr. MacGregor. "But as it turns out, while there's a lot of salt lost in sweat, only just a little bit of calcium is lost. So it was the opposite – hot yoga is actually really good for your bones." Dr. Mathis concurs. "Bikram yoga appears to be a safe practice for [premenopausal women](#)," she says, "though we still recommend that fluid, sodium, and calcium are replenished after hot [yoga](#) practice."

The pair presented their findings this past spring at the American College of Sports Medicine's annual meeting in Denver, Colo., and will soon submit them for publication. They also hope to conduct a follow-up study to determine if there's some sort of "protection mechanism" that the body is able to deploy to prevent bone damage and retain bone mass. "Other researchers across the country have come to the same conclusion that we have, that it's not the [calcium](#) lost through sweating that is causing low BMD in these otherwise very healthy people," says Dr. Mathis. "So that may be what's next for us."

APA citation: Human research study explores effects of hot yoga (2017, November 21) retrieved 20 October 2021 from <https://medicalxpress.com/news/2017-11-human-explores-effects-hot-yoga.html>

*This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.*