

# Bone Research Laboratory

## Mission Statement

We are committed to developing exercise programs across the life span to promote health and prevent osteoporosis-related fractures.

## Osteoporosis and the Bone Research Laboratory

Osteoporosis is a disease of low bone mass that reduces bone strength and increases risk of fracture. Nationwide, more than 340,000 hip and 700,000 vertebral fractures annually carry an estimated economic burden of approximately \$14 billion.

Our goal at the Bone Research Laboratory is to develop exercise programs to prevent osteoporosis-related fractures and thus significantly reduce both the psychological and economic burden of fractures in this country. To this end, we are studying the effects of specific exercise programs at various ages across the lifespan from childhood through older adulthood.

With the graying of America, the number of people at risk for osteoporosis is expected to increase 25 percent over the next decade; thus, osteoporosis is a disease of crisis proportion. Osteoporosis is a preventable disease, and strategies to decrease it are necessary.

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**"Being an integral part of a research team in the Bone Research Laboratory doing a study of elderly individuals who fall affords me an opportunity to gain experience in the research process."**

**Sam Charters,**  
*undergraduate student*

**"The research conducted in the lab is very connected to the populations being researched. We study the effect of exercise on bone, and we teach exercise classes to improve bone density in the community. It's very applied and very uplifting for us as researchers. We are continually reminded how important the work we do is to the people we study. It's very grounding."**

**Kathy Gunter,**  
*graduate student*



*Christine Snow, Ph.D., Director*

## Contact Information:

### Bone Research Laboratory

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## The OSU Bone Research Laboratory

### Internship and Practicum Experience

The Bone Research Laboratory has provided practicum and internship opportunities to more than 75 undergraduate students.

### Graduate Training

Dr. Christine Snow is a major adviser to more than 10 graduate students who are actively involved with teaching and research. Graduate students in the BRL have been awarded several scholarships for both academics and researchers and travel to national and international conferences to present their research.

### Community Service

Clinical bone scans are performed to determine individual risk for fracture and to help individuals and their physicians determine if hormone replacement or other therapies are indicated. A physician referral is required for all scans performed on a clinical basis. General, hip, and spine scans are conducted. Fees for the bone scans are generally reimbursed by insurance carriers. Please contact the Bone Research Laboratory via phone or e-mail for more information on this service. To schedule an appointment, contact the laboratory at 737-5935.

### Funding

Laboratory projects have received funding from the National Institutes of Health, AARP-Andurs Foundation, Erkkila Foundation, NASA Graduate Student Research Program, and American College of Sports Medicine.

### Equipment

The Bone Research Laboratory houses a Hologic QDR 4500A bone densitometer. This instrument accurately and precisely measures bone mass at the hip, spine, and whole body, along with body composition. Other equipment, such as the Nottingham Power Rig, the Accusway, and the GaitRite Walkway, assess physical performance variables associated with bone mass and risk factors for falling.

**OREGON STATE UNIVERSITY**

# Bone Research Laboratory



**College of Health & Human Performance**  
Department of Exercise & Sport Science



## Osteoporosis Risk Factors

Certain factors are linked to the development of osteoporosis and contribute to an individual's likelihood of developing the disease.

Risk factors you cannot change:

- **Sex:** Your chances of developing osteoporosis are greater if you are a woman. Women have less bone tissue and lose bone more rapidly than men because of the changes involved in menopause.
- **Age:** The older you are, the greater your risk of osteoporosis. Your bones become less dense and weaker as you age.
- **Body size:** Small, thin-boned women are at greater risk.
- **Ethnicity:** Caucasian and Asian women are at highest risk. African American and Latino women have a lower but significant risk.

- **Family History:** Susceptibility to fracture may be, in part, hereditary. People whose parents have a history of fractures also seem to have reduced bone mass and may be at risk for fractures.
- **Peak bone mass:** If you entered adulthood with a low peak bone mass, you are at higher risk. Peak bone mass can only be changed during youth.

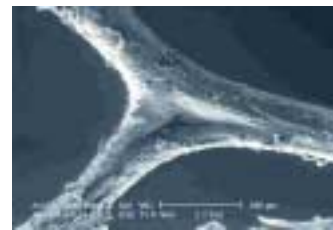
Risk factors you can change:

- **Sex hormones:** abnormal absence of menstrual periods (amenorrhea), low estrogen level (menopause), and low testosterone level in men.
- **Anorexia.**
- **A lifetime diet** low in calcium and vitamin D.
- **Use of certain medications,** such as glucocorticoids or some anticonvulsants.
- **An inactive lifestyle** or extended bed rest.
- **Cigarette smoking.**
- **Excessive use of alcohol.**

## Preventing Osteoporosis

Regular participation in weight-bearing activity has been found to strengthen bones and reduce the risk of osteoporosis, while reduced physical activity and prolonged bed rest result in bone loss. In order for physical activity to reduce fracture risk it must:

- Be weight bearing and occur over the life span.
- Encourage the development of muscular strength and power.
- Subject the skeleton to forces that exceed the threshold of daily activities, i.e., impact activities of short duration.
- Promote dynamic balance in order to reduce falls in the older adult.



## Osteoporosis Facts

- Osteoporosis is a major public health threat for 28 million Americans, 80 percent of whom are women.
- In the United States today, 10 million individuals already have osteoporosis and 18 million more have low bone mass, placing them at increased risk for this disease.
- One out of every two women and one in eight men over 50 will have an osteoporosis-related fracture in their lifetime.

## Bone Research Laboratory Projects

### Long-term participation in exercise using weighted vests reduces hip bone loss and fall risk in postmenopausal women:

In a study of postmenopausal women, nine months of exercise using weighted vests increased muscle strength, lean mass, leg power and balance, all of which reduced risk of falling. These women continued to exercise and, after five years, bone loss was prevented at all regions of the hip, and women who did not continue to exercise lost more than 4 percent in their hips. Furthermore, two of the women who started the program were osteoporotic and the exercise reversed their osteoporosis. For more information on obtaining the exercise program, call toll free **1-888-431-9455**.

Snow C.M., Shaw J.M., Winters K.M., Witzke K.A. Long-term exercise with weighted vests prevents hip bone loss in postmenopausal women. *Journal of Gerontology: Medical Sciences*, 55A:M1-3, 2000.

Shaw J, Snow C. Weighted vest exercise improves indices of fall risk in older women. *Journal of Gerontology: Medical Sciences*, 53:M53-M58, 1998

### Impact Exercise Increases Bone Mass in Premenopausal Women:

We are conducting studies on the effect of jumping exercise on hip bone mass in premenopausal women. Preliminary results demonstrate a significant improvement (3 percent) in hip bone mass in this group of women. Further the program led to increases in muscle strength, power and balance, factors associated with fall risk. However, the positive benefits of impact plus resistance

training on bone mass in premenopausal women is reversed when training is withdrawn. Therefore, continued training is required to maintain the musculoskeletal benefit from exercise.

Winters, K.M., and Snow, C.M. Detraining reverses positive effects of exercise on the musculoskeletal system in premenopausal women. *Journal of Bone and Mineral Research*, 15 (12), 2000.



### Jumping and Growing Bones:

Preliminary results of this research indicate that a 10-minute jumping program significantly increases hip bone mass in children. We intend to use these results to provide a sound basis for incorporating these exercises into physical education classes across Oregon and also nationwide.

Fuchs, R.K., Bauer, J.J., and Snow, C.M. Jumping improves hip and lumbar spine bone mass in prepubescent children: A randomized controlled trial. *Journal of Bone and Mineral Research*, 16 (1), 2001.

### High Intensity Resistance Training in Postmenopausal Women:

High intensity weight training promotes bone gain at the spine and trochanter in older men and at the trochanter in older women. In addition both men and women respond similarly to resistance training regimens.

Maddalozzo, G.F., and Snow, C.M. High intensity resistance training: Effects on Bone in Older Men and Women. *Calcified Tissue International*, 66:399-404, 2000.

### Falls and Hip Fracture Risk:

Three projects are currently under way to study factors related to side falls and hip fractures. Elderly fallers and those at high risk for falling are being recruited, tested, and followed for fall surveillance. Results from these studies will help identify clinical measures to predict side falls and to develop exercise programs to prevent side falls.

Gunter, K.B., White, K.M., Hayes, W.C., and Snow, C.M. Functional mobility discriminates non-fallers from one-time and frequent fallers. *Journal of Gerontology: Medical Sciences*, Nov. 55A (11): M672-677.

### Reducing Osteoporosis Risk Through Exercise Instructor Training Course (RORE):

The RORE course is taught by trained researchers from our laboratory. In this course exercise instructors develop an understanding of the osteoporosis and exercise research and its relationship to fracture reduction, learn the exercise needs and concerns of postmenopausal women, increase knowledge of bone health, develop competence in exercise techniques for fracture risk reduction, and learn appropriate safety considerations for individual needs. If you would like to attend this workshop please contact the Bone Research Laboratory for more information.

