



Osteoporosis Canada

Ostéoporose Canada

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# osteoporosis

**update**

a practical guide  
for Canadian physicians

## Males at risk

Guidelines for detecting  
and managing bone  
loss in men

### case study

After prostate cancer,  
do patients on ADT  
need bisphosphonates?

### questions & answers

Putting jaw problems  
in perspective

New once-a-year therapy  
on the horizon

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# Bone up on male health issues

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**Stephanie Kaiser**, MD, FRCPC is Medical Director of the Osteoporosis Centre and Associate Professor, Division of Endocrinology and Metabolism, at Dalhousie University in Halifax, Nova Scotia.

**M**en are increasingly alert to the threat prostate cancer poses as they grow older. But how many are aware of their risk of developing osteoporosis, or the relationship that may exist between these two conditions? This edition of *Osteoporosis Update* puts the spotlight on male concerns in a disease traditionally relegated to the domain of women's health.

Osteoporosis affects one in eight Canadian men, and the incidence is on the rise as men are living longer. Increasingly, research is providing evidence of significant morbidity and mortality, as well as a substantial economic burden, associated with male osteoporosis. This serious health issue remains, however, underdiagnosed and undertreated. Members of the Scientific Advisory Council (SAC) published updated recommendations on the appropriate diagnosis and management of osteoporosis in men in a recent issue of the *Canadian Medical Association Journal*. Here, we highlight key points addressed by these experts, which should be of interest to both general practitioners and specialists.

Prostate cancer frequently involves the use of androgen deprivation therapy (ADT) to reduce or eliminate testosterone, which stimulates growth of this tumour. As androgens also help to maintain bone health in older men, ADT can contribute to the multiple risk factors for bone loss already existing in this population. Dr. Angela Cheung enlightens us on management strategies in this important area.

In addition, a commentary by Dr. Aliya Khan will hopefully alleviate certain fears and concerns around bisphosphonate-induced osteonecrosis of the jaw — a serious but extremely rare problem. Since this issue has come to public attention, osteoporosis specialists have been fielding calls from concerned physicians, dental health professionals and patients alike. Another Q&A by Dr. Jacques Brown presents evidence around a new bisphosphonate infusion given once-a-year that holds promise for Canadian osteoporosis patients.

We hope that this issue will provide useful information to health professionals involved in the day-to-day care of osteoporosis patients. The SAC invites your feedback (please send all correspondence to [osteo@parkpub.com](mailto:osteo@parkpub.com)).

## SAC announcements

Osteoporosis Canada is pleased to announce the three-year appointments of Alexandra Papaioannou, MSc, MD, FRCPC, as new Chair and William Leslie, MSc, MD, FRCPC, as Vice Chair of the Scientific Advisory Council (SAC). Dr. Papaioannou replaces Anthony Hodsmann, MB, BS, FRCPC, who served as Chair of the SAC from 2003 to 2006. Dr. Papaioannou is Research Director in the Division of Geriatric Medicine and Associate Professor of Medicine at McMaster University in Hamilton, Ontario. Dr. Leslie is Professor in the Departments of Internal Medicine and Radiology, Faculty of Medicine, at the University of Manitoba, and Chair of the Manitoba Bone Density Program.

# Bone strategies in a prostate cancer patient

**A** 56-year-old patient of mine with prostate cancer failed both a radical prostatectomy and salvage radiotherapy. However, his cancer has been completely controlled with hormonal therapy (Lupron® plus Casodex®) for a year and a half. A recent bone density test showed mild osteopenia, but no osteoporosis (T-score -0.8 at the lumbar spine [L1-L4], -1.3 at the left femoral neck and -1.1 at the left total hip). He exercises regularly and follows a good diet. He has nevertheless elected to take Fosamax 70 mg once every three days off-label in the hopes that it will slow formation of bone metastases. Is this a potentially good strategy? Should he be taking supplemental vitamin D and calcium?

— A GP from Halifax, Nova Scotia

**Dr. Angela Cheung comments:** There are two issues with your patient: the first is whether a man with prostate cancer starting androgen deprivation therapy (ADT) needs to go on bone preservation therapy, like a bisphosphonate; second, whether bisphosphonate therapy prevents bone metastases in prostate cancer patients.

Prostate cancer is the most frequent male cancer, usually occurring in those over age 50. Osteoporosis is also common in this population, occurring in one in eight men over the age of 50 in Canada.<sup>1</sup> Men with prostate cancer often have multiple risk factors for bone loss even prior to starting ADT. One study that investigated 41 men commencing ADT for prostate cancer observed hypogonadism, hypovitaminosis D and dietary calcium intakes below the Recommended Daily Allowance (RDA) in 20%, 17% and 59% of patients respectively.<sup>2</sup> Other risk factors include being Caucasian or Asian, smoking, excessive alcohol consumption, physical inactivity and certain diseases and medications such as chronic use of glucocorticoids.<sup>3</sup>

Both estrogens and androgens help to maintain bone health in older men. Estrogen prevents bone resorption while both hormones play a role in bone formation.<sup>4,6</sup> As serum levels of sex hormones decrease with advancing age, bone mineral density (BMD) also gradually declines. The goal of ADT is to lower testosterone levels even further, thereby slowing the progression of prostate cancer. Originally, ADT involved bilateral orchiectomy accompanied by estrogen injections, but the most common method used today is either a luteinizing hormone-releasing hormone (LHRH) agonist such as leuprolide acetate (Lupron) alone or the same agent in combination with an oral nonsteroidal antiandrogen (NSAA) such as bicalutamide (Casodex). A recent meta-analysis of 16 prospective studies suggests that LHRH agonists can cause bone loss of 1% to 3% after 12 months, but NSAAs appear to be bone-sparing.<sup>7</sup> Examining five randomized controlled trials evaluating therapies for

ADT-induced bone loss, the authors also suggest that 12 months of bisphosphonate treatment protects against ADT-induced bone loss. However, there are no randomized controlled trials showing that bisphosphonate therapy prevents fractures in this population.

For a patient with prostate cancer going on ADT, I would suggest getting a baseline BMD test, which you have performed. A recent survey of Canadian urologists and radiation oncologists showed that few physicians would order BMD tests for men with prostate cancer on ADT.<sup>8</sup> For younger men (age < 70 years) with only osteopenia and a BMD T-score > -2.0, I would suggest lifestyle management such as ensuring adequate calcium (1500 mg/day) and vitamin D (800 IU/day) intake, either through diet or supplements, decreasing alcohol intake and smoking cessation. I would also repeat their bone density test in one to two years to check for any significant bone loss. Not all prostate cancer patients on ADT will have bone loss. Your patient's 10-year fracture risk is low (< 10%), based on the recent Canadian guidelines for fracture risk assessment.<sup>9</sup> For those who are older (age > 70 years) and have BMD T-scores < -2.0, I would suggest considering starting bisphosphonate therapy to prevent bone loss and osteoporotic fractures.

With regard to the second issue, bisphosphonate therapy (especially zoledronic acid) has been shown to reduce the complications and progression of bone metastases in prostate cancer patients.<sup>10</sup> It has also been shown to have anti-tumour effects on prostate cancer cells in preclinical models. However, there is no evidence to indicate that bisphosphonate therapy in addition to ADT in prostate cancer patients without bone metastases will reduce their occurrence, prolong survival or improve quality of life. Thus, I would not suggest using Fosamax at the unconventional dose of 70 mg every three days for the prevention of bone metastases at this time. ●

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# Osteoporosis in men

## Managing an underdiagnosed condition

**O**steoporosis Canada (OC) published clinical practice guidelines for the diagnosis and management of osteoporosis in Canada in 2002.<sup>1</sup> In a paper that appeared recently in the *Canadian Medical Association Journal (CMAJ)*,<sup>2</sup> members of the Scientific Advisory Committee (SAC) updated the guidelines with additional information on the appropriate diagnosis and management of osteoporosis in men. This article outlines the key points developed in that document.

While osteoporosis affects more women than men, it remains a serious male health issue associated with significant morbidity and mortality. According to the Canadian Multicentre Osteoporosis Study (CaMOS), a population-based sample of healthy men and women living in the community, the incidence of vertebral deformities (often representing vertebral fractures) is similar in men and women over the age of 50: 21.5% and 23.5%, respectively.<sup>3</sup> Multiple vertebral fractures increase with age in men as they do in women, and appear to be due to underlying osteoporosis in males. Further, although most hip fractures (73%) occur in women, men who break a hip are more likely to suffer morbidity and die.<sup>4</sup>

### Fracture risk and diagnosis

Table 1 lists factors identified by OC and the World Health Organization (WHO) that increase fracture risk in men, independent of bone mineral density (BMD). The OC 2002 guidelines recommend BMD testing for men aged 65 and older. In the presence of secondary causes of bone loss (Table 2) and other key risk factors for fracture, younger men should also undergo bone densitometry.

WHO and OC recommend the following classifications when interpreting BMD readings:

- **Men ≥ age 50**
  - T-score\* ≤ -2.5: Osteoporosis
  - T-score between -1.5 and -2.5: Reduced bone density
- \*T-score = standard deviations BMD is above or below the mean value for that of normal young adults
- **Men < age 50**
  - Z-score† < -2.0: Below expected range for age
  - Z-score ≥ -2.0: Within expected range for age
- †Z-score = standard deviations BMD is above or below the age-matched mean normal reference range

It is important to note that osteoporosis is not diagnosed in the absence of a fragility fracture in men under the age of 50. Individuals with low bone mass are not necessarily at increased risk of fracture, and should be further assessed with stratification of fracture risk.

### Absolute fracture risk

In 2005, OC and the Canadian Association of Radiologists published new recommendations that provided a method of identifying an individual's 10-year absolute fracture risk based on age, sex, BMD, prior

**Table 1**

Factors that increase fracture risk in men

#### Primary factors

- Prior fragility fracture after age 40, especially vertebral compression fractures\*
- Systemic glucocorticoid therapy (> 7.5 mg prednisone/day) ≥ 3 months duration
- Advancing age (especially after age 65)

\*Height loss ≥ 6 cm or kyphosis may be a clinical sign of a vertebral compression fracture

#### Other key risk factors

- Alcohol intake > 2 units/day (1 unit = 9 gm)
- Primary or secondary hypogonadism
- Use of LHRH analogs (antiandrogen therapy)
- Smoking (current or history of)
- Family history of osteoporosis or fracture
- Low BMI (< 20 kg/m<sup>2</sup>)

fracture and glucocorticoid use.<sup>5</sup> According to this document, a fracture risk > 20% would denote a high probability of fragility fracture; 10%–20%, moderate risk; and < 10%, low risk (Figure 1). These guidelines are based on Swedish data, but a preliminary analysis of Canadian data confirms very similar risk profiles. A more comprehensive calculation by the WHO of 10-year absolute fracture risk involving data from multiple databases, expected soon, should help physicians determine appropriate candidates for treatment.

### Investigations

Table 3 outlines laboratory tests to assess osteoporosis in men. Complete evaluation entails a detailed history and physical exam with identification of possible contributing factors, baseline and serial height measurements to detect development of underlying vertebral compression fractures, tests to exclude secondary causes of bone loss, and lateral thoracic and lumbar spine radiographs to identify vertebral fractures, in the presence of back pain, height loss or kyphosis. Clinical assessment of bone turnover markers is not recommended at this time.

### Treatment

Table 4 (page 7) presents recommendations for managing osteoporosis in men. Physicians should consider pharmacologic intervention for the following groups (at high risk of fragility fracture):

**Table 2**

Secondary causes of bone loss

- Primary or secondary hyperparathyroidism
- Vitamin D inadequacy (serum 25-OHD < 70 nmol/L)
- Malabsorption state (e.g. short gut syndrome, inflammatory bowel or celiac disease)
- Rheumatoid arthritis
- Hyperthyroidism
- Malignancy (e.g. myeloma or bony metastasis)
- Hepatic insufficiency
- Chronic lung disease
- Hypercalciuria

- men ≥ age 65, with T-score < -2.5 at any measured site (spine, hip forearm);
- men ≥ age 50 with a fragility fracture or vertebral compression fracture and T-score < -1.5. When the measured BMD is well preserved (particularly at the hip, which is less influenced by degenerative osteophyte formation), prevalent vertebral fractures may reflect previous trauma rather than osteoporosis;
- all men on glucocorticoid therapy ≥ 3 months duration, with T-score < -1.5;
- all men with clinical hypogonadism from any cause, with T-score < -1.5.

Despite limited clinical trial data on the efficacy of anti-resorptive therapy in idiopathic osteoporosis in men, best evidence supports a primary role for bisphosphonates.<sup>6</sup> Of these medications, alendronate and risedronate are approved in Canada for treatment of osteoporosis in men. A randomized clinical trial of 241 men (mean age 63 years) with a fragility fracture or T-score ≤ -2 at the femoral neck compared the effect on BMD of 10 mg alendronate daily vs placebo, in addition to 500 mg calcium and 400 IU

**Table 3**

Laboratory assessments for osteoporosis

**Tests to exclude secondary causes of bone loss**

- Complete blood count
- Serum calcium
- Albumin
- Liver transaminases
- Serum creatinine (and calculated creatinine clearance)
- Alkaline phosphatase
- Thyroid-stimulating hormone (TSH)
- Testosterone (total and free or bioavailable)

**Additional tests where indicated by clinical evaluation**

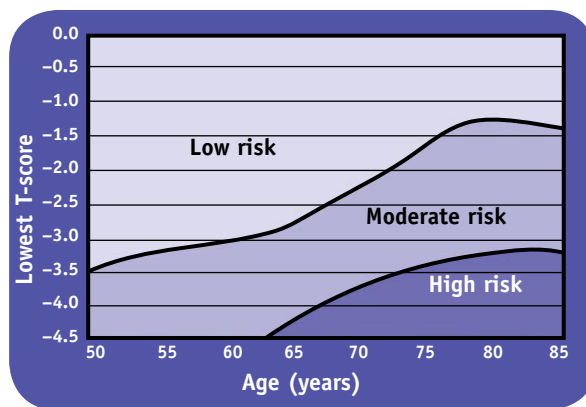
- Parathyroid hormone (PTH)
- Serum 25-hydroxy vitamin D
- Serum immunoelectrophoresis
- Celiac antibody testing (to gliadin, endomyosial, tissue transglutaminase)
- 24-hour urine: calcium
- 24-hour urine: free cortisol

vitamin D, over 24 months.<sup>7</sup> Lumbar spine BMD increased by 7.1% in the alendronate arm, vs 1.8% in the placebo group. Equivalent efficacy was seen in eugonadal and hypogonadal men. A recent open-label trial demonstrated that risedronate 5 mg/day is effective in reducing vertebral fractures by 60% in men with primary or secondary osteoporosis within 12 months of starting therapy.<sup>8</sup> Also, a 2-year double-blind study evaluating risedronate 35 mg weekly vs placebo has shown improvements in BMD in comparison to placebo.<sup>9</sup> Both alendronate and risedronate improve BMD and reduce fracture risk in men and women with glucocorticoid-induced osteoporosis.<sup>10,11</sup> Men treated with risedronate had fewer vertebral fractures than those on placebo.<sup>11</sup> Cyclical etidronate also prevents glucocorticoid-induced bone loss in men and women.<sup>12</sup>

Testosterone therapy improves BMD at the spine and hip over 3 years in hypogonadal men,<sup>13</sup> but no trials have proven that it reduces fractures. It may be most appropriate for men with symptoms of hypogonadism (e.g. sexual dysfunction, anemia) in whom testosterone may provide additional extraskeletal benefits.

**Figure 1**

Zones of fracture risk for men based on BMD and age



Originally published in: Siminoski K et al. Recommendations for bone mineral density reporting in Canada. *Can Assoc Radiol J* 2005;56:178-88.

Studies have shown that subcutaneous teriparatide (rhPTH 1-34), recently approved in Canada for osteoporosis management in men and women, leads to significant improvements in BMD in both groups.<sup>14</sup> Vertebral and nonvertebral fracture benefits have been reported only in postmenopausal women,<sup>15</sup> however, as trials in men were not powered for these outcomes. *CMAJ* published new OC guidelines on PTH use in patients with osteoporosis in 2006<sup>16,17</sup> (see highlights at [www.osteoporosis.ca](http://www.osteoporosis.ca)).

To date, no fracture data are available on the use of calcitonin in men.

Lifestyle and nutritional recommendations are similar for men and women, as outlined in the OC 2002

Continued on page 7

q.

**How should we advise our patients concerning possible jaw problems (osteonecrosis of the jaw) due to bisphosphonate use?**

**Dr. Aliya Khan explains:** It is important to put this issue into perspective, in order to avoid undue concern that may result in nonadherence to bisphosphonate therapy. In a recent review of the likely incidence of osteonecrosis of the jaw (ONJ), Bilezikian summarized the risk of occurrence in patients treated with conventional oral doses of bisphosphonates for osteoporosis as being no more than 1:100,000 patient-years of bisphosphonate exposure (*N Eng J Med* 2006;355:2278-81). As an adverse event, this incidence places the risk in the “very rare” category.

Bisphosphonate-induced ONJ is an avascular necrosis (bone death due to poor blood supply) that may occur in the upper or lower jawbone (maxilla or mandible) in certain patients. Since it was first described in the literature in 2003, a number of surgical and dental centres have published their experience with the condition.

The majority of patients diagnosed with ONJ had malignancies, notably breast or myeloma, and were receiving intravenous (IV) bisphosphonates (pamidronate or zoledronic acid), frequently in large doses, for metastatic bone disease. The literature has also documented some cases with use of oral bisphosphonates. According to published reports to date, most patients have also received radiation therapy and/or chemotherapy including the use of steroids. An inciting event, most commonly dental surgery such as tooth extraction, was present in the majority of cases. It is not clear if the bisphosphonate was a causative or a contributing factor to the development of ONJ in certain patients at high risk.

In a review of 368 reported cases of bisphosphonate-associated ONJ, 60% occurred after dental extraction or surgery (Woo SB et al. *Ann Intern Med* 2006;144:753-61). IV bisphosphonates had been prescribed in 94% of cases, and 85% of patients had underlying multiple myeloma or metastatic breast cancer. Oral bisphosphonates were prescribed for osteoporosis or Paget’s disease in 4% of patients. The doses used in oncology are higher and given more frequently than for osteoporosis. Duration and dose of the bisphosphonate appear important in the risk of developing ONJ. ONJ occurrence following oral bisphosphonate use has not been studied separately;

however, as noted, estimates indicate that the incidence is no higher than 1:100,000 patient-years of exposure.

IV bisphosphonates are effective in controlling hypercalcemia in patients with metastatic disease and stabilizing metastatic bone lesions while bypassing the gastrointestinal tract. In cancer patients, the benefits of these agents outweigh the risks of developing ONJ.

ONJ is not easily treatable with medical and surgical intervention. Hyperbaric oxygen, antibiotics and careful limited debridement have been used. Surgery should be performed cautiously, as it may lead to further bone exposure and exacerbate the condition. The bisphosphonate can be continued in the presence of metastatic bone disease as it may stabilize the metastatic deposits. Pain is controlled with analgesics and any secondary infections that may be present are treated. Prevention is key; the following are some practical recommendations:

- Advise patients at risk for ONJ to complete any invasive dental work (root canal, extraction) prior to initiating bisphosphonate therapy.
- Treat existing gingival infections.
- Suggest, if possible, that patients avoid invasive dental procedures while they are on bisphosphonates.
- Inform patients of the importance of maintaining good oral hygiene with regular dental care. Dentures should be adjusted to ensure that there is no local trauma or friction to the gumline. Noninvasive dental work does not require delaying the bisphosphonate.
- Discussion between involved physicians and dentists can be of value in clarifying any misconceptions.

Further research is needed into this rare but serious condition. The exact relationship between ONJ and bisphosphonate therapy also needs to be clarified. Prospective studies should address the relative effects of important comorbidity such as the presence of cancer, use of steroids and chemotherapy, diabetes, smoking and peripheral vessel disease on the development of ONJ. Further data are expected shortly from a collaborative effort with Canadian Oral Surgeons, currently in process.

q.

**Is the new once-yearly bisphosphonate infusion a safe and effective alternative compared to other bisphosphonates currently available for osteoporosis patients?**

**Dr. Jacques Brown answers:** Promising evidence on Aclasta® (zoledronic acid) was recently presented at the American Society for Bone and Mineral Research (ASBMR) Annual Meeting. To date, Aclasta® is the only bisphosphonate available as a once-a-year IV infusion. The HORIZON (Health Outcomes and Reduced Incidence with Zoledronic Acid Once Yearly) pivotal fracture trial — an international, Phase III, randomized, placebo-

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**Dr. Jacques Brown** is a rheumatologist at the Centre hospitalier de l’Université Laval, in Quebec City, and Clinical Professor in the Department of Medicine at the Université Laval.

controlled trial of 7,736 women — evaluated the effect on fracture risk of a once-a-year infusion of 5 mg zoledronic acid over three years in postmenopausal women with low BMD who were unable or unwilling to take oral bisphosphonates (Black DM et al. ASBMR 2006 Annual Meeting:1054). Primary endpoints were the incidence of new vertebral and hip fractures compared to placebo. All the study participants received calcium (1000–1500 mg) and vitamin D (400–1200 IU) daily. The results showed a 70% risk reduction in new spinal fractures ( $p < 0.0001$ ) and a 40% risk reduction in hip fractures ( $p = 0.0032$ ) over three years in the women who took Aclasta compared to those in the placebo arm. Secondary endpoints, including risk reduction in clinical spine and non-spine fractures, were also met.

The most frequent side effects associated with the IV infusion were fever, muscle pain, flu-like symptoms, headache and bone pain (10%–15%). The majority of these symptoms occurred within the first three days of administration and subsided within a few days; they are similar to those seen with other IV bisphosphonates such as pamidronate. The incidence of these events decreased with subsequent doses, and they are not a contraindication to continuation of Aclasta.

Another Phase III randomized, multicentre trial (McClung M et al. ASBMR 2006 Annual Meeting:SU32), which compared the effects of a single infusion of Aclasta vs continuation of oral alendronate 70 mg/week for 52 weeks in 225 postmenopausal patients with low BMD previously treated for at least one year with oral alendronate, reported similar BMD values for both treatment groups. In the patients taking Aclasta, bone turnover remained within the normal premenopausal range at 12 months after one infusion, confirming that patients who switch from weekly oral alendronate to Aclasta can maintain bone benefits for one year. Adverse events observed were similar to those in the HORIZON trial.

Another study has shown that patients prefer the once-yearly bisphosphonate treatment option over a once-weekly pill format (Lindsay R et al. Sixth European Congress on Clinical and Economic Aspects of Osteoporosis and Osteoarthritis [ECCEO], 15–18 March 2006, Vienna).

Aclasta is available across Canada for treatment of Paget's disease of bone, but is not yet approved for osteoporosis. Clinical trials are currently underway in this country to assess its potential to treat osteoporosis in men, postmenopausal women and patients with corticosteroid-induced osteoporosis. ●

feature continued from page 5

**Table 4**  
Treatment of osteoporosis in men

Drug and dosage	Comment
Total daily calcium intake (diet and supplementation): 1500 mg	Lower amount in the presence of hypercalcemia or hypercalciuria
Total daily vitamin D3 (cholecalciferol): $\geq 800$ IU	
Bisphosphonates <ul style="list-style-type: none"> <li>• Alendronate 70 mg q weekly*††</li> <li>• Risedronate 35 mg q weekly††</li> <li>• Cyclical etidronate 400 mg od for 14 days (90 day cycles)†</li> </ul>	Contraindications: allergy to previous bisphosphonate exposure; renal failure (glomerular filtration rate $< 30$ ml/min)  Side effects usually limited to GI intolerance
Anabolic therapy <ul style="list-style-type: none"> <li>• Teriparatide 20 mcg od, subcutaneously for 18 months</li> </ul>	Contraindications: skeletal malignancy, history of internal or external radiotherapy of the skeleton, Paget's disease, hypercalcemia

\*Treatment, idiopathic osteoporosis in men  
†Prevention, glucocorticoid-induced osteoporosis  
‡Treatment, glucocorticoid-induced osteoporosis

Side effects: nausea, headaches, muscle cramps

guidelines.<sup>1</sup> An update by Whiting et al provided additional information on improving nutrition in people with or at risk of osteoporosis.<sup>18</sup>

Osteoporosis is underdiagnosed in older men, but it is associated with significant morbidity and mortality. Appropriate management can lead to a significant reduction in fracture burden. ●

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## about Osteoporosis Canada

Osteoporosis Canada is a national, not-for-profit organization dedicated to educating, empowering and supporting individuals and communities in the prevention and treatment of osteoporosis.

The organization, guided by its Scientific Advisory Council (SAC) made up of osteoporosis experts from across the country, works with healthcare professionals to make the latest prevention, diagnostic and treatment options available to Canadians.

[www.osteoporosis.ca](http://www.osteoporosis.ca)

## ENDOCRINOLOGY UPDATE DAY 2007

Friday, May 25, 2007

University Hospital,  
London Health Sciences Centre

Save the date for an exciting day presented by the University of Western Ontario and McMaster University, and supported by Osteoporosis Canada, the American Association of Clinical Endocrinologists (AACE), Canadian Society of Endocrinology and Metabolism (CSEM) and International Society of Clinical Densitometry (ISCD).

Symposia include updates on:

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## RESEARCH AWARDS

Osteoporosis Canada wishes to congratulate Dr. Ralph Amo Zirngibl and Dr. Jane Aubin (co-investigator) from the Department of Molecular and Medical Genetics, Faculty of Medicine at the University of Toronto — successful recipients of a Canadian Institutes of Health Research (CIHR) New Investigator Award under the Small Health Organization Partnership Program (SHOPP). The researchers will receive \$25,000 from Osteoporosis Canada and \$25,000 from CIHR a year for two years for their project, titled *The role of the estrogen receptor related receptor alpha in osteoblast development and bone homeostasis: Generation of a mouse model*.