

## **OSTEOPOROSIS: Prevention and Treatment.**

Dietary and lifestyle factors have an impact on our bone strength and thus our risk of suffering from osteoporosis. The most effective way of strengthening our bones and preventing an osteoporotic fracture is a combination of **adequate nutrition and exercise**.

Osteoporosis, characterised by low bone mass and deterioration of the bone tissue structure, leads to fragile bones and is a major cause of fractures in the elderly. Whilst not only the elderly are affected, there is an increasing risk of an osteoporotic fracture as we age due to the progressive lowering of bone mineral density after age 40<sup>6</sup>. **Over 70% of women and 50% of men over 80 years of age have osteoporosis**, however, the majority of those with osteoporosis remain undiagnosed until a fracture occurs.<sup>1</sup> Osteoporotic fractures occur in over 50% of all women and 33% of men over the age of 60.<sup>6</sup> These fractures occur most commonly in the spine, hip, wrist, upper arm or ribs. Whilst a hip fracture results in a 20% risk of death within 6 months, it is likely to also result in a much reduced quality of life and chronic pain.<sup>1</sup>

The strength of our bones is measured with a DXA scan which gives a comparison of our bone density to that of an average 22 year old. This is the age at which our bones are at their strongest. As we age, and particularly after menopause in women, bone density gradually declines. This is why it is so important to build up our bone density in our early years through adequate nutrition and exercise; and aim to maintain it through our adult years. **Calcium intake and vitamin D** along with adequate **weight-bearing exercise** are the most important factors.<sup>1</sup>

### **RISK FACTORS FOR OSTEOPOROSIS**

Whilst genetics is the major risk factor for developing osteoporosis, various diet and lifestyle factors also impact on the likelihood of suffering from this disease. These include:

***A low body weight with a low muscle mass***  
***Low vitamin D levels***  
***Low dietary calcium***

***Low levels of physical activity***  
***High salt intake.***  
***High alcohol consumption & smoking***

Certain medical conditions increase osteoporotic risk, including rheumatoid arthritis, inflammatory bowel diseases and undiagnosed or poorly controlled coeliac disease. Long-term use of some medications, such as corticosteroids, can also increase the risk.<sup>1,8</sup>

### **PREVENTION BEGINS IN CHILDHOOD**

Whilst osteoporosis is most common in the elderly, prevention commences at an early age. Building strong bones commences in childhood with higher levels of calcium intake during childhood resulting in higher bone density. A particularly crucial time for bone growth is during adolescence, when bone mass triples. It is imperative that teenagers have optimal nutrition to obtain optimal bone mass, particularly during their growth spurt and/or if pregnant or lactating.<sup>1,3</sup>

### **CALCIUM REQUIREMENTS**

Our requirements for calcium intake differ throughout our various life stages. The following table lists the daily recommended dietary intakes (RDIs) for calcium for Australians.<sup>3</sup>

| <b><i>Children &amp; Adolescents</i></b> | <b>RDI Calcium</b> |                     | <b><i>Adults</i></b> | <b>RDI Calcium</b> |
|--|--------------------|---------------------|----------------------|--------------------|
| 1-3 years                                | 500mg              | <b><i>men</i></b>   | 19-70 years          | 1000mg             |
| 4-8 years                                | 700mg              |                     | >70 years            | 1300mg             |
| 9-11 years                               | 1000mg             | <b><i>women</i></b> | 19-50 years          | 1000mg             |
| 12-18 years                              | 1300mg             |                     | >50 years            | 1300mg             |

Younger children should be having 2-3 serves of calcium rich foods each day. For older children, adolescents and adults, at least 3 serves of calcium rich foods each day will give an intake of 1000 to 1300mg. Note that calcium absorption is not always as high from non-dairy food sources, such as green vegetables.<sup>6</sup>

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### **The following foods and drinks are equivalent to approximately 250mg (one serve) of calcium**

|                            |  |
|----------------------------|--|
| 1 cup (250mL) milk         | 1 cup (250mL) calcium fortified soy drink          |
| ½ cup evaporated milk      | 3 oranges  |
| 1 tub (200g) yoghurt       | 100g (¾ cup) almonds                               |
| 2 slices (40g) hard cheese | 160g Brazil nuts                                   |
| 1 cup (250mL) custard      | 250g raw spinach or 500g (2½ cups) cooked broccoli |
| 200g cottage cheese        | 100g canned salmon with bones                      |
| 50g tofu                   | 50g sardines                                       |

### **VITAMIN D**

Vitamin D is essential for calcium absorption. Whilst small quantities of vitamin D are obtained through our diet (fortified margarine, oily fish and meat, especially liver) this vitamin is mostly produced by our bodies due to the action of **sunlight** directly onto our skin: ie without sunscreen. The elderly, individuals with darker skin, or those who do not expose their skin to sunlight are at greatest risk of low vitamin D levels. During **summer** in Australia less than 10 minutes of direct sunlight is all that is required for fair skin to achieve the daily requirement of this vitamin.<sup>5</sup> However, during **winter**, particularly in the southern states, much longer exposure is required. Fair-skinned individuals need approximately 30 minutes of direct sun exposure each day in the colder months while darker skin requires up to 3 hrs. These exposure times are for direct sunlight on **15% of the body**, for example the face, hands and arms.<sup>5</sup> Vitamin D **supplementation** is recommended if levels are low.

### **OTHER NUTRITIONAL FACTORS<sup>8</sup>**

A low **protein** intake, as is often evident in the elderly, can contribute to increased bone loss and there is evidence that increasing protein intake along with calcium and vitamin D supplementation increases bone mineral density in the elderly.<sup>6</sup> Hip fracture patients given protein supplements show less bone loss and a shorter hospital stay.<sup>6</sup>

High levels of **fruit and vegetables**, which contain **potassium, vitamin K, magnesium, zinc, copper, manganese and vitamin C** along with other beneficial nutrients, can be of benefit for developing and maintaining strong bones. Higher levels of **salt** and **sodium** in the diet deplete the body of calcium through the kidneys. This effect is seen at intakes higher than 6g of salt daily, which is actually much less than the average level of intake in Australia.<sup>7</sup>

**Caffeine** consumption can have a negative effect on bone density, particularly at low calcium intakes. **Alcohol** intake at greater than 2 standard drinks per day can result in an increased risk of osteoporosis and fracture, while regular consumption of **carbonated drinks** (eg soft drinks) is associated with reduced bone strength.

Individuals with **lactose intolerance** who may avoid dairy foods need to ensure their calcium needs are being met and should be aware of low lactose dairy products and lactase enzyme products (to break down the lactose) on the market. Yoghurts and hard cheeses are suitable dairy foods for lactose intolerant individuals

### **PHYSICAL ACTIVITY**

The optimal benefits of nutrition on bone density also requires adequate physical activity in the form of **high impact and weight bearing exercises**. Brisk walking, jogging, jumping, skipping and hopping are beneficial; as are sports such as netball or basketball where jumping is involved. A weights programme at home or at the gym (with gradual increases in the weights used) is ideal to combine with high impact exercises for optimal bone strength. Balance exercises are also beneficial as they reduce the incidence of falls that can result in osteoporotic fractures.

### **SUPPLEMENTATION & FORTIFICATION OF FOODS**

Supplementation may be required if dietary intake is inadequate. Calcium is absorbed equally as well from supplements as it is from dairy. Calcium absorption may be reduced by other mineral supplements such as iron, so if taking both, separate them by at least two hours. Calcium fortified foods can be a very useful addition to the diet, particularly in the elderly, who are often unlikely to meet their RDI due to a reduced food intake with aging. These fortified foods can also be useful if compliance with supplementation is low. Examples of calcium-fortified foods available in Australia include some milks, orange juices, breakfast cereals and breads.

References. 1. www.osteoporosis.org.au/osteo. 2. Wardlaw et al 2004, Perspectives in Nutrition Appendix N, Food composition table...3. Dietary guidelines for Australians Commonwealth of Aust 2005. 4. FiataroneSingh 2007 Medicine Today 8(3):69-74. 5. www.osteoporosis.org.au/files. 6. www.iofbonehealth.org.