

## Bone health & Cystic Fibrosis

As we get older our bones become thinner and weaker. Thinning of the bones can occur at an earlier age for people with Cystic Fibrosis (CF).

### Osteopenia and osteoporosis

Osteopenia and osteoporosis are terms that mean bones are “thinner” than they should be. This means that the bones are more fragile and more likely to fracture.

### What is Bone Mineral Density (BMD)?

Bone mineral density (BMD) is a measure of the level of minerals the bones contain. This shows how strong the bones are.

BMD is usually measured by dual energy x-ray absorptiometry (DEXA) scan. The low radiation dose used in the DEXA scan is less than that needed for a chest x-ray. The scan is taken at these sites on the body for approximately two or three minutes:

- Lumbar spine (below the chest and above the pelvis)
- Top of the leg (hip)
- Wrist
- Whole body

It is important to note that the BMD score may not accurately predict the fracture risk in people with CF.

A DEXA scan will be performed from about ten years of age and repeated every one to three years. Check with your doctors when your next scan is due.

### What are Bone Mineral Density “Z” and “T” scores?

- BMD measurements are scored according to how much they are below or above the population average value.
- BMD results are reported as Z-scores or T-scores.

- Z-scores are usually the most appropriate method in people with CF.
- The Z-score compares a measured BMD value to the average value from a healthy population of the same sex and age as you.
- The T-score compares the measured BMD value to the average value from a healthy young adult population.

### **How do I know what these values mean?**

BMD is very low in people with CF when the Z-score in the spine or hip is lower than  $-2$ .

### **What causes low bone mineral density in CF?**

CF-related low BMD probably has many causes:

- Severe lung disease and recurrent lung infections
- Poor nutrition (low body weight, low levels of minerals (e.g. calcium) and vitamins (e.g. vitamin D and K))
- Certain medications (e.g. steroids)
- Delayed puberty
- CF related diabetes

There may be a direct link between low BMD and the abnormal protein produced by the CF gene.

### **How can low BMD be prevented and treated?**

- Have regular DEXA scans to screen for low BMD.
- Optimise lung function and prevent lung infections.
- Use high energy diets, oral supplements and nasogastric or gastrostomy tube feeds to optimise nutrition.
- Check vitamin D or calcium levels yearly, and correct low levels with extra dietary supplements.
- Have frequent contact with a specialist CF dietitian to get advice on how best to boost nutrition for bone health.

- There is not yet enough evidence to recommend universal vitamin K supplementation for bone health in CF. However, supplementation should be considered in certain clinical situations. Always check with your doctor.
- Use weight bearing physical activity. A specialist CF physiotherapist can develop an exercise programme where appropriate. This will depend on your individual abilities and needs.
- Minimise steroid treatment as advised by your doctors.
- Detect and treat delayed puberty and low levels of testosterone and oestrogens.
- Long acting “depo” and some other progesterone-only contraception methods may reduce BMD, particularly in adolescents. Other methods of contraception may be suggested by your doctors.
- Avoid smoking and alcohol which can have damaging effects on bone health.

### How much calcium do I need?

Calcium intake in individuals with CF should meet the Recommended Daily Intakes (RDI) for the general population. It should be increased to 1500mg/day for those with low BMD.

Category	RDI* (mg/day)
Girls (14-18 years)	1300
Women (19-50 years)	1000
Pregnant women (19-50 years)	1000
Breastfeeding mothers (19-50 years)	1000
Boys (14-18 years)	1050
Men (19-70 years)	840

\*Based on Nutrient Reference Values for Australia & NZ, NHMRC & NZMOH, 2006

<b>Highest Calcium (at least 400mg per serve)</b>
<ul style="list-style-type: none"> <li>• 250mL (1 cup) calcium fortified milk (e.g. Physical, Lite Start, Shape, Pura tone)</li> </ul>
<b>High Calcium (at least 300mg per serve)</b>
<ul style="list-style-type: none"> <li>• 250mL (1 cup) full cream / trim / or skim milk</li> <li>• 250mL (1 cup) calcium fortified soy milk</li> <li>• 200g tub yoghurt</li> <li>• 100g tin salmon with bones or sardines</li> <li>• 2 slices (40g) of hard cheese</li> <li>• 250mL (1 cup) custard</li> </ul>
<b>Medium Calcium (at least 130mg per serve)</b>
<ul style="list-style-type: none"> <li>• 1 cup of ice-cream (full cream or low fat)</li> <li>• ½ cup of almonds</li> <li>• 150g tofu</li> </ul>
<b>Low Calcium (less than 130mg per serve)</b>
<ul style="list-style-type: none"> <li>• Meats and eggs</li> <li>• Baked beans</li> <li>• Fruit (e.g. oranges)</li> <li>• Bread and cereals</li> <li>• Soft cheeses (e.g. fetta, cottage, ricotta)</li> <li>• Green leafy vegetables (e.g. broccoli, spinach)</li> </ul>

## Vitamin D

Vitamin D is an essential ingredient for maintaining a healthy body. It helps maintain muscle and bone strength and allows your body to absorb calcium.

### Sources of vitamin D

The major source of vitamin D in Australia is exposure to sunlight. While small amounts are derived from dietary sources such as oily fish (e.g. salmon), eggs and fortified foods such as margarine and some milks.

## **Monitoring & and supplementation**

Vitamin D levels are screened through a blood test annually. To prevent deficiency, the minimum recommended Vitamin D level is 75 nmol/l.

All patients with vitamin D deficiency and insufficiency should be prescribed vitamin D supplements. Generally, a supplement of 1000 to 5000 IU/day of vitamin D is used for adults. Check with your CF treating team to find out what your individual needs would be.

## **Are there any specific drug treatments?**

Bisphosphonates (e.g. Aledronate, Residronate) are a group of drugs that reduce bone breakdown and may stimulate new bone to grow.

Oral Bisphosphonates are best absorbed without food and should be taken on an empty stomach. This may be difficult for people with CF related diabetes or for those who feed overnight. Calcium supplements impair the absorption of bisphosphonates and should not be taken together.

For more information, contact your Dietitian or Cystic Fibrosis Centre.

Acknowledgment to CF Trust 2012 for information provided in this education material.