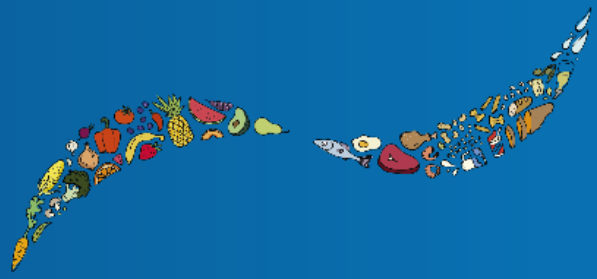
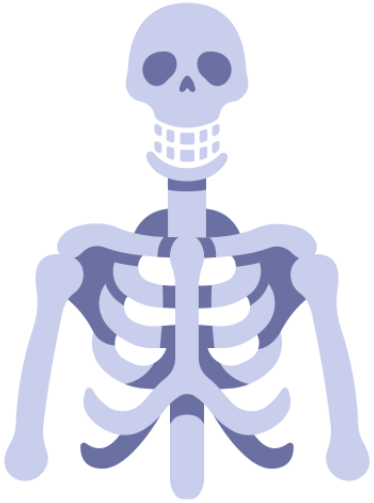


KEY MICRONUTRIENT CALCIUM

Calcium is a mineral that is critical to the formation and maintenance of healthy bones. Whilst bone issues may be rare in swimming this does not mean that we can overlook calcium’s importance in a healthy and performance-focused diet.

CALCIUM – WHAT?

Calcium is a major **bone-forming mineral**. 99% of the body's calcium is stored in our bones.
Calcium provides significant **strength** and **structure** to bone tissue. Along with collagen (*the key protein in bone tissue)* this creates excellent tensile and compressive strength which allows the bone to bend under strain and recover its shape without damage. However, **excessive strain** which exceeds this capacity may cause **failure** and **fracture**.



1-2kg of our body weight is calcium

Calcium for bone growth

Calcium to offset bone loss

Bone tissue is in a constant state of **turnover** so calcium supply is critical throughout our lifecycle. **Childhood** and **adolescence** represents a period of **rapid bone growth** but bone **loss** then **increases** as we **age** so it is important to maximise our bone growth potential in our younger years.
Vitamin D pays an important role in the absorption of calcium from our food. So even with sufficient calcium intake our uptake may be limited by our Vitamin D status.

Beyond bone, calcium also plays an important role in muscle and nerve function but generally we do not consider our dietary intake of calcium to limit these roles.

90%

90% of our peak bone mass is made by the time we are 20!

WHAT'S THE ISSUE?

Swimmers should be concerned about their bone health during both their swimming and non-swimming career.

Osteoporosis is a disease characterised by **low bone mass** and **gradual deterioration** of bone tissue which results in increased bone **fragility** and **fracture** risk. Although osteoporosis may be uncommon in those under 30, gradual bone loss after this age means achieving a **high peak bone mass** in **adolescence** has a strong **protective** effect later in life.

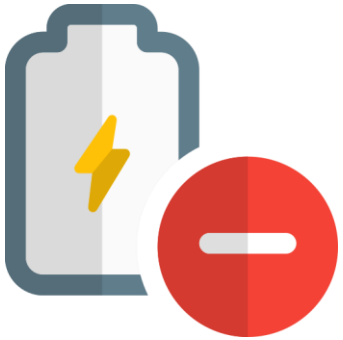
Whilst complete bone fractures in swimming activities are rare, **stress fractures** are more common resulting in **significant time loss** from training/racing. Stress fractures are partial fractures from **repeated stress** to the bone that is less than the force required to fracture a bone in a single application. It is a process rather than a single event and occurs when the **damage** to the bone **exceeds** the bone's **repair** capacity over an extended period of time.

Calcium has a key role to play in both the creation and maintenance of healthy bone tissue and its ongoing repair and resistance to fracture.

AM I AT RISK?

Generally, **exercise** is considered **beneficial** for bone health, but there are some individuals who may be at greater risk:

- **Low calcium intake** as a result of diet choices e.g. dairy-free or vegan diet
- Poor **Vitamin D** status as a result of compromised sun exposure



- Chronic **low energy intake** and/or **low energy availability -** *This could be due to a mismatch in energy intake to expenditure or from desire to manipulate body weight/composition, this is particularly important for female swimmers*
- **Low-carbohydrate** diet and training/recovering in a low-carbohydrate state
- **High energy expenditure** resulting in reduced energy availability

- **Calcium loss** through sweat - *Blood calcium levels are tightly controlled so calcium lost through sweat must be replaced and during prolonged exercise calcium is drawn out of our bones to restore blood calcium balance*
- Minimal **weight-bearing** exercise - *Bone favourably responds to controlled repeated loads such as gym and circuit activities*
- Coeliac disease - *Calcium absorption is compromised*
- Breastfeeding
- Post-menopausal women

HOW MUCH CALCIUM?

Specific **calcium** needs for **athletes** and swimmers have not been established. However, they are likely to be **greater** than that of the general population due to increased calcium loss through sweat.

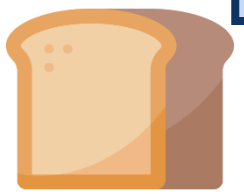
Daily Calcium Guidelines	
MALES 11-18yrs	1000mg/day
MALES >19yrs	700mg/day
FEMALES 11-18yrs	800mg/day
FEMALES >19yrs	700mg/day
FEMALES POST-MENOPAUSE	1200mg/day

Sources of Calcium

200ml milk = 240mg

160g cottage cheese = 200mg

200ml enriched milk alternative = 240mg



1 slice bread = 50mg

1 tin sardines = 480mg

110g broccoli = 50mg

Large orange = 50mg

120g yoghurt or custard = 120-200mg

120g tofu = 200mg

50g fortified cereal = 220mg

30g Ready brek = 400mg

10 almonds = 50mg

CALCIUM IN THE DIET

PRE-MORNING TRAINING	Small bowl of cereal with milk	***250mg***
POST-MORNING TRAINING	Orange juice and cereal bar	***85mg***
BREAKFAST	Bagel with peanut butter	***150mg***
LUNCH	Bowl of soup and a tuna sandwich	***200mg***
PRE-AFTERNOON TRAINING	Yoghurt with granola berries and latte (*dairy or non-dairy*)	***515mg***
EVENING MEAL	Salmon with cous cous and stir-fried veggies	***100mg***
PRE-BED SNACK	Low calorie instant hot chocolate	***50mg***
	TOTAL	***1350mg***

Notice that small snacks often contribute more calcium than main meals

A large dose of calcium before endurance exercise can help offset the calcium lost via sweat

A sufficient daily calcium intake for most swimmers within a 2500kcal meal plan