



AQUAMIN

Marine Minerals for Health
The Importance of Bioavailability.





Aquamin The Importance of Bioavailability

Dr. Denise O’Gorman, B.Sc., Ph.D.

What is Aquamin

Aquamin is a natural, marine-derived, multi-mineral, from the Lithothamnion species of red algae, rich in calcium and magnesium as well as 72 other trace minerals. It is crafted naturally in the sea, providing bioavailable minerals in the same ratios as needed for optimal use by the human body. The structure of Aquamin is also unique. It is highly porous in nature maximising absorption and bioavailability.

It is well accepted that calcium bioavailability is influenced and enhanced by the presence of other minerals.

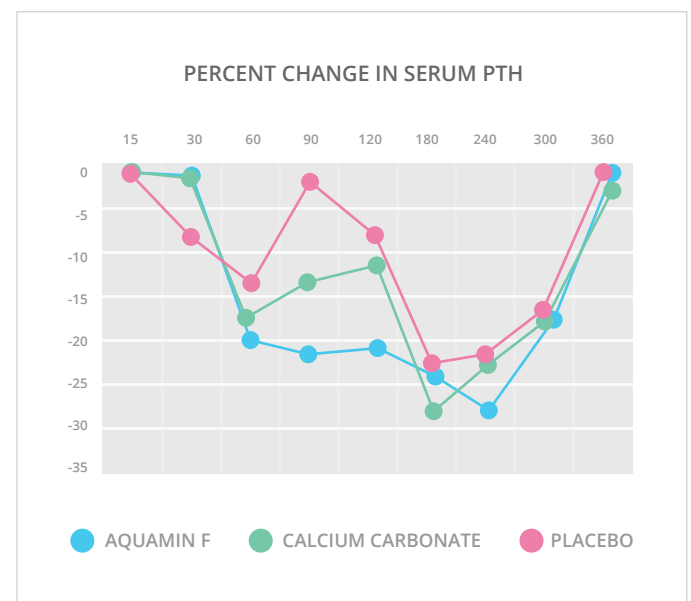
At Marigot Ltd, we have carried out many studies to prove the bioavailability of Aquamin over that of other calcium sources, especially those mined from rocks. These studies exploit the known sensitivity of serum parathyroid hormone (PTH) to calcium levels. Insufficient levels of calcium in the body trigger PTH to release calcium from bone, stimulating bone breakdown. Therefore, lowering PTH levels over both the short and long-term is a dual indicator of the bioavailability of calcium and of bone protection

Bioavailability

Study 1

This double-blind, placebo-controlled, cross-over study² measured the bioavailability of Aquamin versus calcium

carbonate (CaCO₃) and placebo over 6 hours in 12 pre-menopausal women. The results were dramatic, after just 60 minutes, the ability of Aquamin to reduce the levels of PTH significantly exceeded that of CaCO₃ and this trend continued for the duration of the study, Figure below.



Study 2

A second longer-term, double-blind, placebo-controlled, parallel-group study lasting 3 months was also carried out. Sixty post-menopausal women were randomised to Aquamin, CaCO₃, Tri-calcium phosphate (TCP) or placebo groups and PTH levels were recorded. After 3 months, PTH levels had significantly decreased in subjects taking Aquamin.

- 1 Saltman & Strause (1992) J. Am. Coll. Nutr. 12(4):384-9
- 2 Minnesota Applied Research Centre, USA (unpublished)
- 3 Shandon Clinic, Cork, Ireland (unpublished)
- 4 Slevin et al., Under review 2013.
- 5 Aslam et al., (2013) Biol Trace Elem Res: In Press

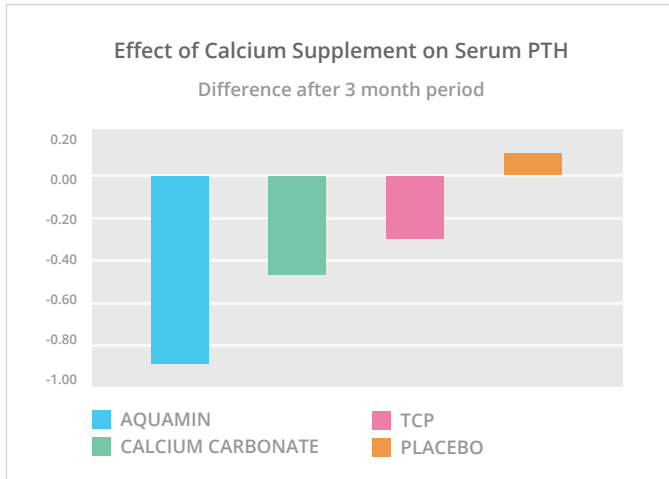
- 6 O’Gorman et al., (2012) Phyto. Res. 26(3):375-80
- 7 Widaa et al., Phytotherapy Res (2013) In press
- 8 Barry et al., (2011) Med & Sci in Sports & Exer 43(4):617-23
- 9 Aslam et al., (2010) Calcif Tissue Intl 86(4):313-24
- 10 Lee et al., (2010) J Exp Biomed Sci, 16(4):213-20





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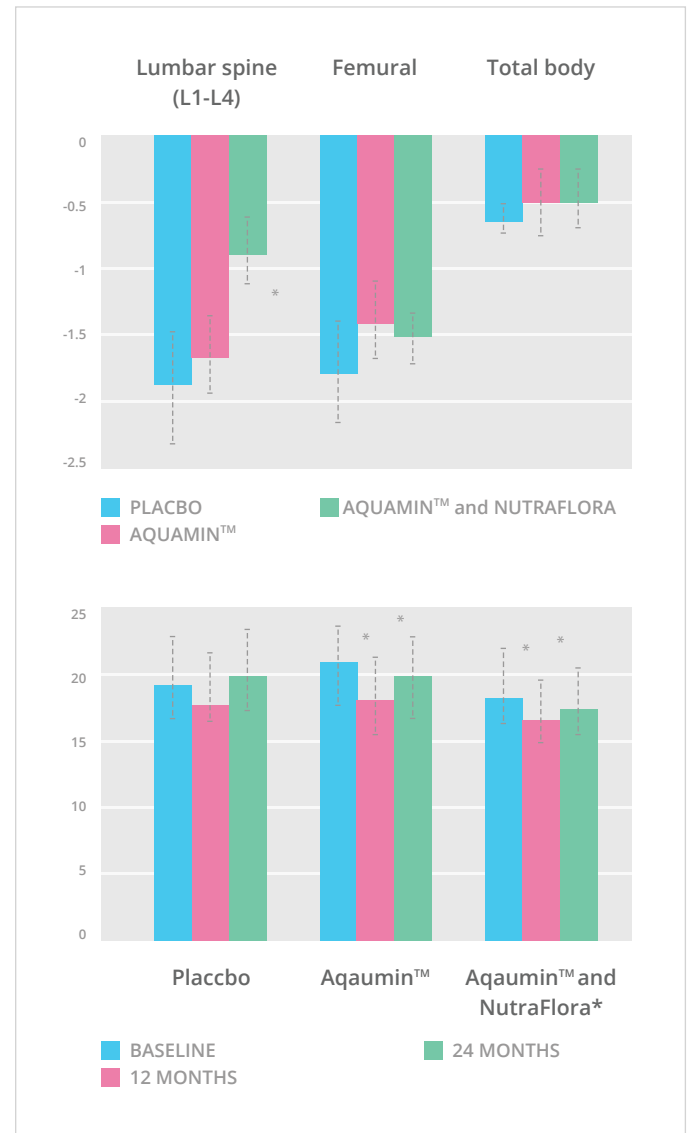


Bone Osteoporosis is a ‘silent’ disease striking one in three women and one in five men globally. It is however, a preventable disease, if we start building strong bones at an early enough age. While calcium is considered to be the most important mineral in bone, several other minerals also play a major role¹. A calcium only supplement ignores the complete mineral profile essential for healthy bones.

Study 3 Human Clinical Trial

This recent study highlighted the benefits of Aquamin in post- menopausal women. 300 women were randomised to 3 groups, placebo, Aquamin or Aquamin and scFOS (short-chain fructo- oligosaccharides) for a period of 2 years. The results are compelling and are currently under review. Not only did DEXA scans confirm bone protection in the combined Aquamin & scFOS group (Figure below) but significant beneficial

changes were also seen in the bone markers, osteocalcin (figure below) and CTX, in both treatment groups.



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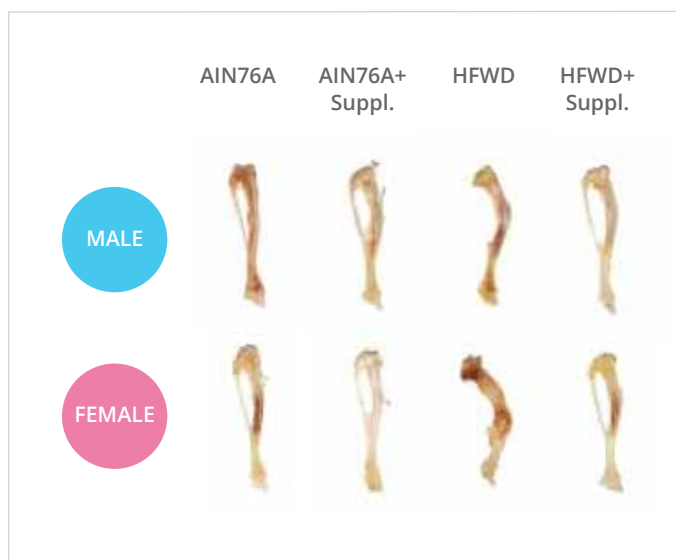


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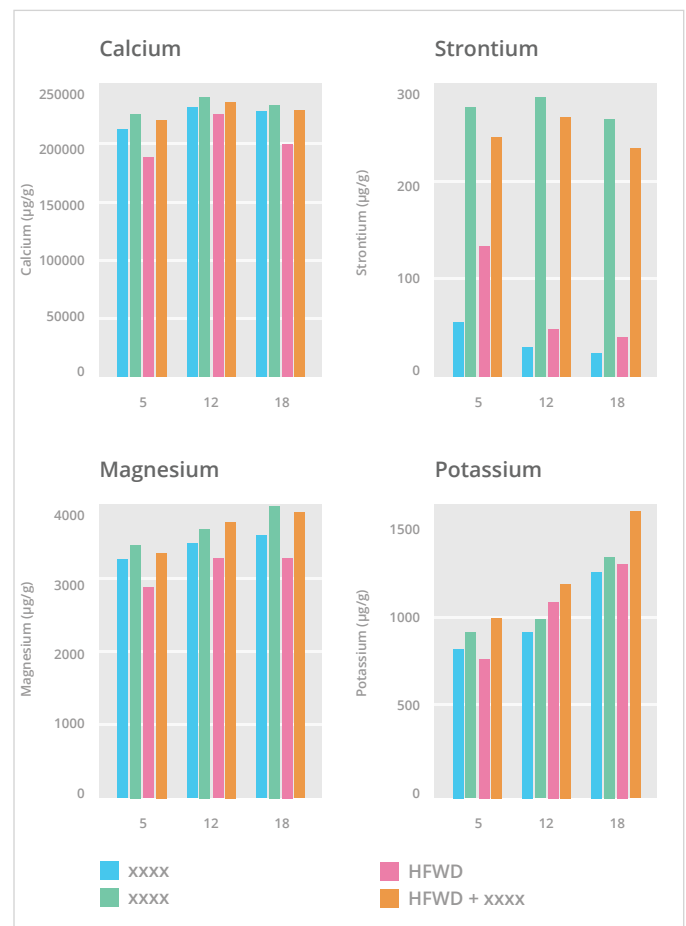
Study 4 Aquamin reverses the bone damaging effects of a High Fat Western Style Diet (HFWD).

Poor diets, especially those containing a high proportion of fat, or those lacking in essential minerals have been identified as risk factors for osteoporosis. This study highlights the benefits of Aquamin when added to both control and high fat animal diets⁵. Bones from the HFWD diet show deformity and fragility at the end of the 18 month dietary modification compared to those diets supplemented with Aquamin (figure below)



The trabecular bone also shows significant deterioration in the absence of Aquamin (not shown) echoing the results in study 9.

When the long bones from all the mice in each group were pooled a numerical increase in the amount of calcium, magnesium and potassium was seen with Aquamin supplementation. The most significant increase was seen in the levels of strontium following supplementation with Aquamin. Strontium is used in many pharmaceutical drugs to protect from bone deterioration and fragility.



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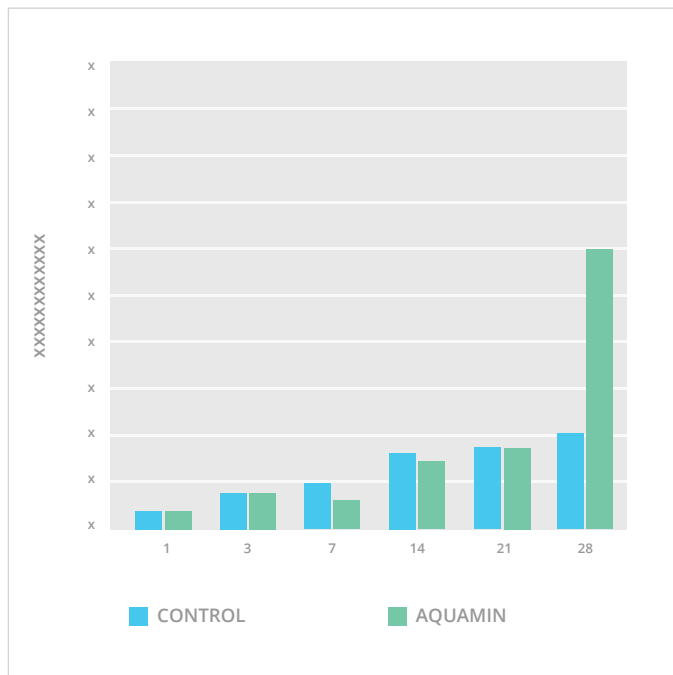
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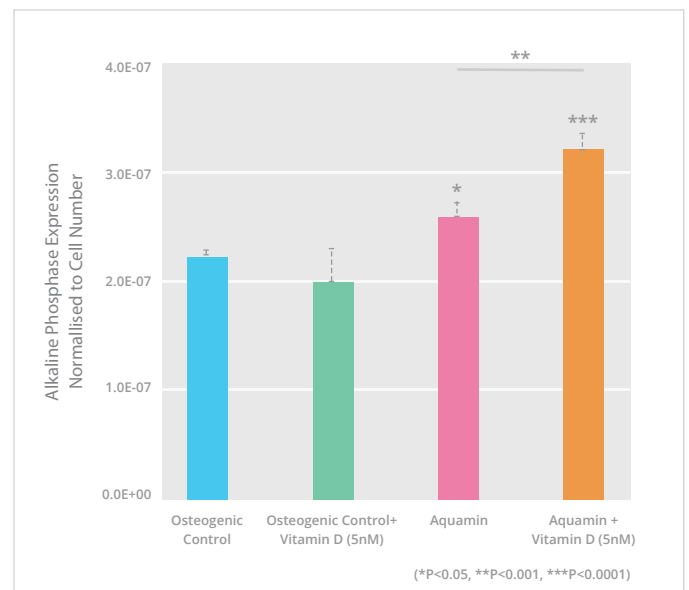
Study 5 Aquamin actively promotes mineralisation of bone cells.

This publication proves that Aquamin with its rich supply of minerals directly benefits osteoblasts, the building blocks of bone. This study confirms that the bioavailable minerals, magnesium, manganese, barium, strontium and iron as well as calcium are needed for optimum bone formation.

Murine osteoblasts cells were grown in optimal tissue culture media for 28 days. Incredibly when Aquamin was added mineralisation of these cells increased threefold.



Study 6 A more recent study showed that these beneficial effects on bone were further enhanced in the presence of Vitamin D.



Study 7 Aquamin protects bones during high- intensity exercise.

Excessive exercise and sweating can lead to bone damage. Even a small loss of calcium through sweat can trigger an increase in serum parathyroid hormone (PTH) leading to bone breakdown. This study proved that Aquamin before exercise could protect bone, by preventing an increase in PTH.

20 adult male cyclists carried out three 35 km time trials

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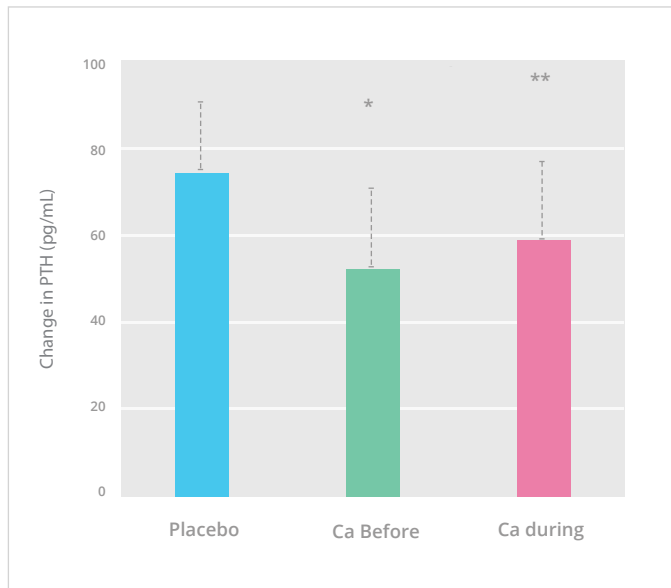




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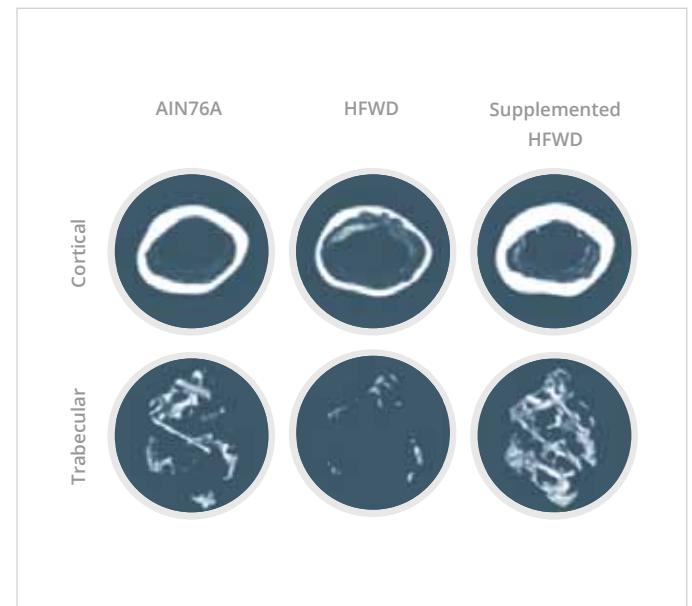
Aquamin-containing sports drinks taken either before or at 4 intervals during the time trial or a placebo. Figure below.



Study 8 Aquamin reverses the bone damaging effects of a High Fat Western Style Diet (HFWD).

In this 15 month study, an earlier version of Study 4 highlighting the detrimental effects of a poor diet on bone, mice were fed either a) control ‘chow’ or b) a HFWD or c) a HFWD & Aquamin. Female mice on the HFWD showed significant bone deterioration compared to control mice while mice on the HFWD & Aquamin diet showed improvements in bone structure. Interestingly, the control group containing CaCO₃ had an equivalent calcium level to the

HFWD & Aquamin diet, again indicating the superiority of highly bioavailable calcium and the value of a natural multi-mineral mix.



Aquamin prevents the harmful effects of a HFWD as shown in both the outer cortical and inner trabecular ‘spongy’ bone. AIN76A is the control ‘chow’ diet containing CaCO₃.

Study 9 Aquamin F combines with probiotics to protect against bone loss.

Probiotics enhance mineral absorption from the intestine. This study proves that the combination of Aquamin and probiotics can improve bone health over probiotics alone.

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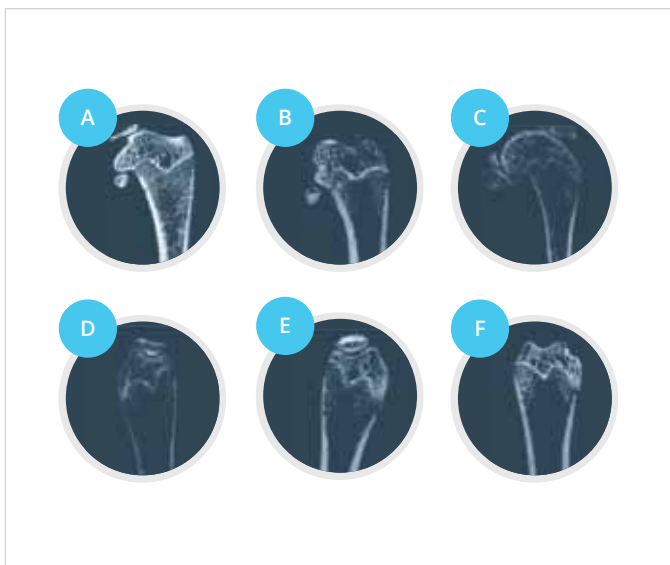




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The rat OVX osteoporosis model closely represents the human menopause. Adult rats have their ovaries removed and quickly develop many of the negative symptoms of menopause including rapid bone loss.



The femur bone in A) is a control bone where ovaries are intact. In B) the intact animals were fed a calcium deficient diet. In C) the animals had their ovaries removed (OVX) and were fed a normal diet. The diets were then supplemented with D) probiotics E) Aquamin or F) probiotics and Aquamin.

These results show that Aquamin alone (E) prevents deterioration of bone and this is further improved on the addition of probiotics *L paracasei*, *L rhamnosus* and *S thermophilus* (F).

Study 10 Bioavailability of calcium in-vitro

This study was carried out by Professor Nora O’Brien at University College Cork in Ireland. For these experiments, a plant-based (Aquamin) and a rockbased mineral source (Dolomite) were compared by subjecting samples to in-vitro digestion and subsequent analysis by AAS. The respective magnesium and calcium levels are graphed below.

For both calcium and magnesium, Aquamin shows twice the level of bioavailability as dolomite.

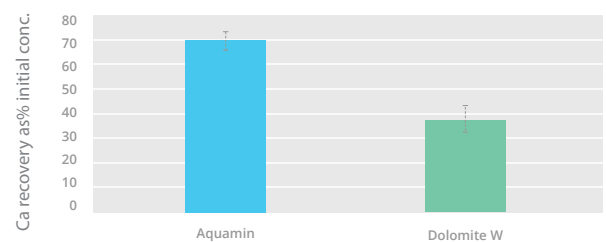


Figure 1 Percent calcium recovery from supplements digested at a concentration of 2.0 mg calcium/mL digestate. Each bar represents three individual experiments \pm SE.

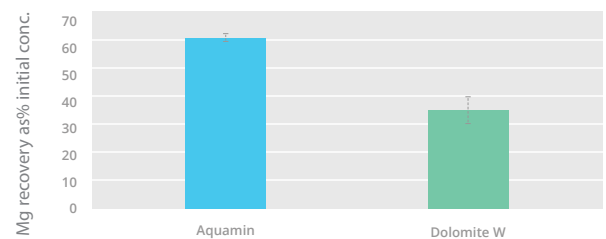


Figure 2 Percent magnesium recovery from supplements digested at a concentration of 2.0 mg magnesium/mL digestate. Each bar represents three individual experiments \pm SE.

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AQUAMIN™

MARINE MINERALS FOR HEALTH



WHAT IS AQUAMIN:

A unique marine multi-mineral complex providing bio-active calcium, magnesium and 72 other trace minerals.



APPLICATION:

A versatile ingredient for the value added fortification of food, beverage and supplement products.



HEALTH INGREDIENTS
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Visit us at Health Ingredients Europe:
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www.aquamin.org