

## Fruits, Vegetables and Bones

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It is no secret that consumption of fruits and vegetables is very beneficial to humans. Earlier this year, I wrote about a large Italian epidemiological study<sup>1</sup> that found lower rates of angina, arthritis, asthma, bronchitis, cirrhosis, gallstones, heart attack, kidney stones and peptic ulcers in men and women who ate the most fruits and vegetables.<sup>2</sup> It has also been recognized for many years that vegetarians have a lower incidence of osteoporosis.<sup>3</sup>

Recently, researchers from Tufts University analyzed surviving participants of the famous Framingham heart study.<sup>4</sup> They wanted to know what effect the consumption of fruits, vegetables and certain minerals had on bone mineral density (BMD). Measurements of BMD were taken from three sites on the hip and one area on the forearm. Dietary histories were analyzed for the amounts of potassium, magnesium, fruits and vegetables that were consumed. The researchers' findings were as follows:

- Higher potassium intake was associated with increased BMD in 4/4 areas in men and 3/4 areas in women.
- Higher magnesium intake showed an increased BMD in 2/4 areas in men and 2/4 areas in women.
- Higher fruit and vegetable intake was associated with greater BMD in 3/4 areas in men and 2/4 areas in women.

In 1997, a study was published which found that premenopausal women who ate more fruits and vegetables had greater BMD in the spine and trochanter.<sup>5</sup>

### Interpretation

It is my guess that the association researchers have noticed between consumption of fruits and vegetables and bone mineral density will probably be explained in one or more of the following ways:

1. Diets with alkaline residues influence the body's pH balance by buffering acidity normally associated with digestion and exacerbated by high consumption of animal muscle and grains. By creating a more alkaline environment, less calcium is released from bones to buffer (neutralize) acid buildup.
2. Vitamin K is plentiful in most fruits and vegetables and is a critical substance for activating osteocalcin (a bone protein), which in turn is an essential component to bind calcium molecules to bone protein matrix. Low vitamin K levels correlate with demineralized bone, which is more susceptible to fracture and osteoporosis.

3. Other lifestyle factors may have a correlation. In my practice, people who eat greater amounts of fruits and vegetables also tend to consume less alcohol, tobacco, caffeine and soft drinks, all of which have been shown to negatively affect bone mineral density.<sup>6,7</sup> I have also noticed that patients who consume more fruits and vegetables tend to exercise at greater levels, which is arguably the best single intervention to increase the strength of the skeleton.<sup>8</sup>

## Conclusion

These studies are quite intriguing, but the findings are preliminary. It appears lifetime consumption of a diet rich in fruits and vegetables is beneficial to the human skeleton. We cannot say that fruits and vegetables will have the same effect treating demineralized bone that exercise, calcium and vitamin D have. We can say that all of the observed benefits of a plant-based diet come from people who ate whole foods.<sup>2,4,5</sup> There is no evidence that substituting salads and smoothies with fruit and vegetable pills will have the same effects.

## References

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