## Food for thought - a bar of chocolate a day keeps the doctor away?

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With Christmas approaching fast, I can't help thinking about those enticing chocolate treats waiting under the tree. Rather than just another sweet indulgence, could they actually be good for me? Runners World's Nutrition pages say that you can burn fat with chocolate by lowering insulin resistance, blood pressure and cholesterol. Each of these assertions is based on a scientific study, so it must be true, mustn't it?

I've looked in detail at one study, from the University of California, which prompted a Daily Mirror headline suggesting that dark chocolate is as good for our health as exercise. In the study, scientists found that epicatechin, a compound found in cocoa, enabled mice to exercise longer on a treadmill. These positive effects were similar to those seen after endurance exercise training in man, where muscle's ability to supply and use energy is enhanced. This type of training is also associated with decreased risk of cardiovascular and other diseases in man.

That's beginning to sound like really good press for epicatechin, as it seems to provide a training effect, without all the hard work! But read on……

The study involved groups of middle-aged mice being fed epicatechin, or epicatechin plus treadmill exercise training, or exercise only, for two weeks. When the three groups of mice were compared, the epicatechin group was able to exercise longer before tiring than did the exercise-only group, however the epicatechin plus exercise group produced the best result. So, perhaps there's no short cut to avoid the established route of training to increase endurance, after all.

The Californian scientists went on to look at potential mechanisms. The improvements in muscle performance seen in the study were not limited to the mouse leg muscles which were found to have an increased blood supply and increased numbers and activity of mitochondria within the muscle cells; mitochondria also increased in number and activity in the heart muscle. Mitochondria are the site of energy production in the body's cells. They also increase in number and activity in response to exercise training, suggesting that epicatechin may mimic the effect of regular exercise on the cell's ability to produce energy and therefore to work for longer before tiring.

Dr Moh Malek, senior researcher, has been quoted as saying, "Applying what we know of epicatechin's ability to boost mitochondria may provide a way to cut the effects of muscle aging. We hope to identify in the future if humans could get the same benefits as mice." There's an important clue in that quote – Dr Malek highlights that his study involved mice and that further work is required to look at the effects in man…..

This study is not alone in suggesting that epicatechin, or dark chocolate (which is rich in epicatechin), is beneficial to our health and well being. Evidence of the beneficial effects of cocoa in cardiovascular disease, including improved cholesterol levels and blood pressure, is well established. The epicatechin and exercise combination produced the greatest positive effects in mouse skeletal and cardiac muscles in the study. Both types of muscle suffer reductions in mitochondrial capacity with age and this study suggests that epicatechin, in combination with exercise, may not only halt age-related reductions, but also lead to improvements in mitochondrial function and exercise capacity.

The message that chocolate is good for us is almost certainly universally attractive. Dark chocolate is a rich source of epicatechin however this feature needs to be balanced against its calorific and fat content. Cocoa, in its natural form, has a bitter taste. It is mixed with significant amounts of sugar and fat in chocolate bars, sweets and sauces.

No matter how attractive the prospect of a chocolate-flavoured fountain of youth may seem, there will be no short cut to avoid the need for regular exercise whilst acquiring the benefits of dark chocolate. If the mouse study is repeated in man, the equivalent dosage would be 200g of dark chocolate per day, that's a large-sized bar, supplying a massive 1100kcal of energy. If the combination with exercise is then shown to be the most beneficial in enhancing muscle activity in man, the exercise component will also need to offset the considerable calorific value of the chocolate if weight gain is not an inevitable consequence.

Christmas is a time to relax and enjoy good food, good wine and good company, and to indulge ourselves a little. You can be assured that I will be eating at least a couple of squares of 90% cocoa each evening – perhaps you will join me!

Californian Study:
NOGUEIRA, L., RAMIREZ-SANCHEZ, I., PERKINS, G. A., MURPHY, A., TAUB, P. R., CEBALLOS, G., VILLARREAL, F. J., HOGAN, M. C. & MALEK, M. H. 2011. (-)-Epicatechin enhances fatigue resistance and oxidative capacity in mouse muscle. *Journal of Physiology,* 589**,** 4615-31.