

Quails get super fit by simply eating omega-3 diet

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When tiny semipalmated sandpipers embark on their annual odyssey from the Canadian Arctic to their winter residences in South America, they set out on one of the world's longest migrations. On the way, the tiny birds stop off at the Bay of Fundy on the Canadian east coast, where they spend two weeks gorging on a superfood, Corophium volutator (mud shrimps), which have some of the highest levels of n-3 fatty acids (better known as omega-3 fatty acids) of any marine animal.

According to Jean-Michel Weber from the University of Ottawa, omega-3 fatty acids have some rather astonishing effects. In humans they reduce the risk of <u>coronary heart disease</u> and alleviate depression. But it was not their potential medicinal properties that intrigued Weber; it was their ability to increase aerobic capacity, much like endurance training. Could the sandpipers be building up for their endurance challenge by simply eating? All the evidence suggest so, but Weber needed to test the miraculous fatty acids' effects on less athletic <u>birds</u>, bobwhite quails, to be sure. Could he boost the couch potato quails' endurance by simply feeding them omega-3 fatty acids? Weber and his team publish their discovery that quails can get fit simply by eating a diet rich in omega-3 fatty acids on 27 March 2009 in The Journal of <u>Experimental Biology</u>.

Teaming up with student Simba Nagahuedi, Weber fed three groups of the sedentary quails a tightly regulated omega-3 diet of n-3 eicosapentaenoic acid, or n-3 docosahexaenoic acid, or a 50/50 mixture of the two oils for 6 weeks. Then Nagahuedi checked the quails' pectoral



muscles to see if their capacity to consume oxygen to produce energy had improved. Measuring the activity levels of four oxidative enzymes the duo found that the enzymes' activity levels had increased by between 58 and 90% to levels normally only seen in the migrating sandpipers. Weber admits that he was astonished by the increase. Even top human endurance athletes only improve their oxidative enzyme activities by 38 to 76% after 7 weeks of hard endurance training. But the quails had done even better without getting off their bottoms; they had got fit by simply eating omega-3 fatty acids.

However when Weber tried to find out how the enigmatic fatty acids manifested their remarkable influence, the results were less clear. Teaming up with Vance Trudeau and Jason Popesku to measure the levels of a key molecule that regulates oxidative enzyme levels, known as PPAR, Weber could not find any evidence for a change in PPAR gene expression in response to the 6 week diets. However, he adds that it does not mean that PPAR levels do not change earlier to influence the bird's performance during the oil diet.

Nagahuedi and Weber also measured the omega-3 fatty acid levels in the muscle cell membranes, and found that the fatty acid was evenly distributed between all of the different membranes in muscle cells. So the birds were not improving their endurance by selectively allocating the fatty acids to the energy generating mitochondria.

Having convinced himself that the sandpiper's mud shrimp diet is responsible for the migrant's outstanding stamina, Weber is keen to find out exactly how the birds increase their oxidative enzyme activity levels to power their long flight south.

<u>More information:</u> Nagahuedi, S., Popesku, J. T., Trudeau, V. L. and Weber, J.-M. (2009). Mimicking the natural doping of migrant sandpipers in sedentary quails: effects of dietary n-3 fatty acids on



muscle membranes and PPAR expression. J. Exp. Biol. 212, 1106-1114. jeb.biologists.org

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