Does Caffeine Really Improve Performance?

New research by a Canadian dietitian suggests it's all about your genes

By Alex Cyr

Sipping on a fresh brew, gulping an energy drink or popping a caffeine tab in the hour before a race has become common practice for runners looking to gain an advantage over their competitors. Amateur and professional runners alike swear by the substance, but do we know for sure if it even provides an ergogenic effect?

Thanks to the research of registered dietitian and PhD candidate Nanci Guest, her colleagues at the University of Toronto and Nutrigenomix, a genetic testing firm based in Toronto, we now know that runners may want to familiarize themselves with their genetic makeup before making a pre-run pitstop at their local Tim Hortons.

Guest's study investigated whether variation in the CYP1A2 gene, which determines the speed at which an individual metabolizes or breaks down caffeine, affected an athlete's response to caffeine supplementation during endurance exercise. The study included 101 competitive male athletes who were categorized as AA, AC or CC genotypes. In a randomized double-blinded placebo-controlled design, participants cycled 10K under three different conditions: having consumed zero, two, or four milligrams of caffeine per kilogram of body weight. The differences in performance, ranging from much faster to much worse during caffeine conditions compared to placebo, helped to uncover the reasons for the inconsistent results seen in caffeine-exercise studies.

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"My study showed that basically not all athletes benefit from caffeine," says Guest. "Through a simple saliva test, we can identify athletes as slow or fast metabolizers of caffeine. These variations have been implicated in different performance outcomes to endurance exercise under conditions of placebo versus caffeine."

Athletes found to have the AA genotype (fast metabolizers of caffeine) experienced a performance benefit and were 4.8 per cent faster when ingesting a low dose (2 mg/kg) and 6.8 per cent faster under the moderate dose (4mg/kg of caffeine. Conversely, when athletes with the CC genotype consumed 4 mg/kg they were 13.7 per cent slower compared to when they consumed the placebo. No effects on performance were observed at either dose in those with the AC genotype. "Think of it as a traffic light," says Guest. "If you are a CC, stop at caffeine. If you are an AC, proceed with caution, and if you are an AA, try caffeine, as you're likely to see a substantial performance boost."

Nutrigenomics, the science of how individuals respond differently to foods, nutrients and supplements based on their genetics, helps scientists understand the implications of genetic variation when reacting to certain foods, such as that which is seen in lactose and gluten intolerances. With some researchers in the field focusing on the interplay between food, genes and sport performance, like Guest, athletes are gaining knowledge, and are now able to tailor their food intake to their individual needs. "Nutritional studies that do not take into account genetic makeup are often incomplete, because we see research reported as the average of what happened in the study group as opposed to looking at individual data," says Guest. "In our lab, we want to learn more about these genetic variations between people, and how certain food constituents might help certain individuals unlock a greater genetic potential."

As for caffeine in particular, Guest admits that more research is needed on how dosing and timing affect performance. Lower doses seem to be the way of the future, as they are effective and can help avoid some of the adverse effects of higher doses. R

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