

CAFFEINE A LOVE STORY

IT'S THE HIGHLY BELOVED
AND MOST INGESTED DRUG
IN THE WORLD, AND FOR
GOOD REASON

BY MATTHEW SOLAN

90
THE PERCENTAGE OF
AMERICANS WHO
INGEST CAFFEINE ON
A DAILY BASIS
— JOURNAL OF THE AMERICAN
DIETETIC ASSOCIATION



Ever since the ancient Chinese brewed the first cup of tea and Ethiopian herders noticed their goats jumping about after munching coffee beans, we've been hooked on caffeine. Each day, nine out of 10 Americans ingest some form of caffeine. Two-thirds comes from the morning coffee slam, and the rest is spread across sodas, tea, energy drinks, supplements and chocolate. We may be hyped about caffeine, but caffeine doesn't deserve its hype as an addictive, dehydrating and dangerous drug. Far from it. Used the right way, caffeine can provide a healthy stimulating effect for both brawn and brain.



5 POUNDS
THE INCREASE IN MAX
BENCH PRESS FOR TEST
SUBJECTS WHO TOOK
ONE DOSE OF CAFFEINE
AN HOUR PREWORKOUT

BEFORE & AFTER

→ Mounting evidence shows that preworkout caffeine can increase endurance, which means more reps, more sets and longer sessions, which translates into bigger muscles. "Next to creatine, caffeine is probably the most effective performance-enhancer," says Jose Antonio, PhD, CEO of the International Society of Sports Nutrition.

Caffeine doesn't directly affect muscles; instead, it influences the central nervous system (CNS) to increase your pain threshold, so it's easier to push through those final reps, extra sets and last treadmill interval.

Research also confirms that caffeine can immediately increase muscle strength. Scientists from the University of Nebraska-Lincoln reported that weight-trained men who took a caffeine supplement one hour preworkout increased the number of reps they could complete on the bench press using 80% of their one-rep maxes.

In a follow-up study, the same lab reported that weight-trained subjects who took one dose of caffeine preworkout increased their max bench-press weights by about 5 pounds. A 2008 study by Indian researchers also found that when subjects consumed 2, 4 or 6 mg of caffeine an hour before training, their muscle strength and

endurance increased with larger doses.

This CNS effect also increases lipolysis, the breakdown of fat. This becomes an additional workout fuel source and triggers a thermogenic response to raise body temperature and promote calorie-burning. "So in effect, caffeine increases your fat-burning ability while it improves your workout performance," Antonio points out.

If you want to jump-start muscle refueling, make sure to add caffeine to your postworkout meal. Australian scientists found that endurance cyclists who ingested a beverage of carbohydrates and caffeine equal to 8 mg per kilogram of bodyweight — about 5–6 cups of coffee — had 66% higher glycogen levels four hours after exercise compared to those who drank a carb-only beverage. Caffeine increases glucose uptake from the blood into the muscles, and faster glycogen recovery means shorter recovery time and more energy for your next workout.

Caffeine is also believed to enhance the activity of several signaling enzymes, including protein kinase and protein kinase B, both of which enhance muscle glucose uptake. Higher glycogen levels also increase muscle size, since glycogen pulls water into muscle cells.

MYTH: Caffeine Can Sober You Up

→ Slugging caffeine won't offset a drinking binge, says a 2009 report in *Behavioral Neuroscience*. It'll make you a more alert drunk, but researchers suggest this could have a negative effect because it skews your rational thinking. This means you're more likely to engage in risky behavior such as driving or picking a fight with the bouncer, suggests co-author Thomas Gould, PhD, of Temple University (Philadelphia).



→ Don't just load up on energy drinks — find your ideal tolerance level



1.4–2.7
MILLIGRAMS OF CAFFEINE
PER POUND OF BODYWEIGHT
TO CONSUME FOR OPTIMAL
RESULTS. FOR EXAMPLE,
A 180-POUND GUY WOULD
NEED 250–490 MG

USE, DON'T ABUSE

→ More isn't always better. Gulping cans of Red Bull won't automatically produce a bull-like physique. You have to consume the right amount based on your weight, and at the right time, for caffeine to work.

Everyone reacts to caffeine differently, but most studies suggest the ideal zone is from 100–200 mg to 600 mg. "Less than that doesn't appear to help and any more doesn't provide additional benefits," Antonio explains. A good formula to follow is 3–6 mg per kilogram or 1.4–2.7 mg per pound of bodyweight; a 180-pound guy needs about 250–490 mg. (In comparison, the average person's daily intake is about 300 mg.)

Caffeine is absorbed by the stomach and small intestine, and takes 45–60 minutes to reach maximum concentration in the blood. Yet you can often feel the kick within 10 minutes when levels reach one-half its con-

centration, according to a 2008 University of Barcelona (Spain) study. The full effect can last 2–3 hours and diminishes within 12 hours.

Make sure not to overdo it; you need to find your ideal tolerance level. Overindulging can trigger symptoms of caffeine intoxication such as insomnia, overexcitement, restlessness and, in severe cases, muscle twitching, and rambling thoughts and speech. These reactions often strike soon after consumption but wane as caffeine levels fall.

Take a trial-and-error approach: If you experience any symptoms, reduce your pre- and postworkout amounts. In this case, less can actually be more. "You can still benefit from caffeine by consuming it in smaller amounts," says caffeine researcher Daniel P. Evatt, PhD, of the Johns Hopkins School of Medicine (Baltimore).

MYTH: Caffeine Makes You Dehydrated

→ A review of 41 human studies found that caffeine intakes up to 400 mg daily (4 cups of coffee) don't produce dehydration, even when exercising. "Your more frequent bathroom breaks after downing, say, a 64-ounce Big Gulp are due to the extra fluid, not caffeine," says Steven Broglio, PhD, ATC.



FROM TOP: SOMOS/VEEP/GETTY IMAGES, NASH PHOTOS/GETTY IMAGES, PG. 172; ANDREW DERNIE/GETTY IMAGES, PG. 173, FROM TOP: ROBERT REIFF, KYU OH/GETTY IMAGES



266 vs. 320 MILLIGRAMS OF CAFFEINE IN 16 OUNCES OF HOME-BREWED JAVA VS. 16 OUNCES OF STAR- BUCKS BREWED COFFEE

— CENTER FOR SCIENCE IN
THE PUBLIC INTEREST



300 mg/
8.4 oz.



160 mg/
16 oz.



144 mg/
16 oz.



74–80
mg/
8–8.4 oz.



118 mg/
20 oz.

58–68 mg/
12 oz.



DRINK UP

→ Caffeine pills like NoDoz maximum strength may have higher amounts than most beverages (200 mg in one tablet) but take longer to digest. “Caffeine in liquid form is absorbed and takes effect more quickly,” Antonio says.

The best liquid jolts: coffee and energy drinks. A regular 8-ounce home-brewed java boasts an average 133 mg of caffeine, according to the Center for Science in the Public Interest (Washington, D.C.). But if you need a stronger shot, a regular Starbucks coffee contains more than 300 mg per 16-ounce serving.

If coffee isn't your idea of a preworkout beverage, pop open an energy drink. The top jolts are Spike Shooter (300 mg per 8.4 ounces), Monster Energy (160 mg per 16 ounces) and Full Throttle (144 mg per 16 ounces). Popular brands Amp, Red Bull and Rockstar vary from 74–80 mg. Additives like sugar and extras such as ginkgo biloba, ginseng and vitamin B won't interfere with absorption or diminish the effect, Antonio points out.

When it comes to soda, stick with trusted brands. A 2007 study in the *Journal of Food Science* found that recognized names have more caffeine than store brands such as Kroger, Wal-Mart and Winn-Dixie. For the biggest buzz, try citrus-flavored Mountain Dew MDX or Vault Zero, each with 118 mg of caffeine per 20 ounces. Your standard 12-ounce Coke, Dr. Pepper and Pepsi offer a puny 58–68 mg.

→ Studies show caffeine can reduce postworkout muscle pain



WORKS FOR EVERYONE

→ Another advantage of caffeine is it works the same whether you're a caffeine junkie or teetotaler. Research published in the *International Journal of Sport Nutrition & Exercise Metabolism* in 2009 compared pain tolerance of 25 college-age men who were split into two groups: high caffeine users (400 mg per day, or 3–4 cups of coffee) and low consumers (100 mg or less). Subjects took 5 mg of caffeine per kilogram of bodyweight (2–3 8-ounce cups of coffee) and cycled for 30 minutes at a nearly 80% VO_2 max. Afterward, both groups reported less quadriceps pain compared to a placebo team. “What's interesting is the body doesn't seem to become resistant to caffeine's effect,” says co-author Steven Broglio, PhD, ATC, assistant professor of kinesiology at the University of Illinois at Urbana-Champaign.

TOP, LEFT TO RIGHT: RICHARD VOLKER/GETTY IMAGES; PORNCHAI MITTONGTARE, MICHAEL DARTER; ENERGY DRINKS & SODA: ERICA SCHULTZ (3)



→ Even lower doses of caffeine can boost brain function



2 oz./HOUR

RATE AT WHICH DRINKING COFFEE CAN BETTER MAINTAIN CAFFEINE LEVELS, AS OPPOSED TO QUICKLY CONSUMING HIGHER AMOUNTS

— JAMES WYATT, PhD,
SLEEP RESEARCHER

BRAIN BOOSTER

→ Caffeine can pump up your gray matter, too — and you don't need as much. Scientists at the Innsbruck Medical University (Austria) discovered that just 100 mg of caffeine (1 cup of coffee) increases activity in the part of the frontal lobe that influences short-term memory and the anterior cingulum, the part of the brain that controls attention.

Why does caffeine give you that slap-in-the-face brain boost? Basically, it's a case of mistaken identity, Antonio says. Caffeine binds to adenosine receptors in the brain, which when adenosine is involved makes you tired but with caffeine speeds up brain-cell activity.

To maintain that caffeine high, don't bother slamming an extra double espresso. Instead, down small amounts of caffeine — about 2 ounces of coffee, for example — every hour, suggests James Wyatt, PhD, a sleep researcher at Rush University Medical Center (Chicago). "Caffeine blocks the steady buildup of chemical messengers that induce sleep, but you need to maintain levels in the brain," he notes. "A few morning cups will still cause caffeine levels to fall as the day progresses."

TAKE A BREATHER

→ Do you huff and puff on cardio day? Ingesting caffeine within an hour of exercise can reduce symptoms of exercise-induced asthma (EIA) such as chest tightness, cough and shortness of breath, reports a 2009 Indiana University (Bloomington) study. EIA affects 7%–20% of adults; many don't suffer from regular asthma but feel its effects during cardio. Researchers found that 9 mg of caffeine per kilogram of bodyweight (about 720 mg for an 180-pound guy) was just as effective as an albuterol inhaler, which is commonly used to treat EIA.

Caffeine is believed to reduce airway constriction by blocking inflammatory pathways, says study co-author Timothy VanHaitma, MS, of the University of Utah (Salt Lake City). Nonasthmatics won't get the same airway benefit, but 5 mg of caffeine per kilogram of bodyweight was shown to increase cardio power output during cycling and running. **M&F**

MYTH: Caffeine Is Addictive

→ People hooked on daily java are more addicted to the morning routine than uncontrollable caffeine cravings, says Jose Antonio, PhD. Still, kicking a caffeine habit can trigger minor, temporary withdrawal symptoms. "If you're a daily caffeine drinker and you suddenly quit, you may feel like crap for about 48 hours with drowsiness, headaches and irritability, but then your body will adapt," he explains.



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