Ice Baths: As Cool As We Think?

As soon as my body goes under I stop breathing. For a few seconds my breath is caught in my lungs or mouth or somewhere in between. I focus on completing my breath and force the air to come shuddering out of me. The freezing water burns my skin and all of my muscles are tight. I try (unsuccessfully) not to focus on the pain, and tell myself that it's helping my body, and that afterward I'll feel great. Ice baths are a known treatment for sore muscles among athletes amateur and professional alike. For many of us, the sudden loss of breath and aching numbness of a freezing, sore body is not unfamiliar. In fact, soaking in extremely cold water is a pretty popular recovery method. But what– exactly– do ice baths do to our bodies? What are their proven benefits, and what are the drawbacks? Researchers all around the world have been experimenting on aching people, trying to answer these questions. While some studies and theories support their use, others say that sitting in ice won’t do anything for your body.

Before we can look into ice baths, we have to understand how muscles get sore in the first place. They aren't constantly sore, and sometimes after working out you feel fine and other times it hurts to sit down for the next few days. So what makes the difference? According to the American College of Sports Medicine, you usually feel a workout a day or two after if you did something new, or stressed a different muscle than your body usually stresses (Braun and Sforzo *ACSM Information On... Delayed Onset Muscle Soreness*). This pain, called delayed onset muscle soreness (DOMS), is caused
by eccentric muscle action. This type of movement causes muscles to lengthen during exercises; for example, walking down a hill makes the muscles in the front of your legs stretch out. Eccentric muscle action results in tiny tears in your muscle fibers; these make your muscles hurt. And contrary to popular belief, lactic acid is not involved in this process; a lesser-known acid is the criminal. When tissue is damaged, it releases a type of organic acid synthesized from unsaturated fatty acids, called a prostaglandin (Kimball *Heat, Cold and Pain*). Prostaglandins are powerful pain triggers. Three different major enzymes produce prostaglandins, and most treatments for sore muscles focus on controlling and stopping these three enzymes instead of healing the damaged tissue, making them valuable if getting up without groaning is what you’re after, but useless if you want to speed up the healing process.

But no one’s been able to do that yet. Non-steroidal anti-inflammatory drugs (NSAIDs), such as aspirin, ibuprofen and naproxen are some of the most common treatments for muscle soreness (Kimball *Heat, Cold and Pain*). These drugs block the action of the enzymes that synthesize prostaglandins, stopping the torn tissue from creating pain triggers, and stopping the pain pathway that goes from your nerves to your brain. So far, NSAIDs are the closest we’ve come to fixing the problem at its source: the tiny tears in the tissue. Even though scientists know how muscles are damaged in exercise, they haven’t yet figured out how to improve healing. In the absence of a medical treatment for damaged tissue, people have turned to other possibilities, like ice baths.
Bathing in ice is painful. Yet many elite athletes swear by it. Professional teams often sit in ice as a post-game or post-practice ritual. The theory behind it is that the cold temperature constricts blood vessels and brings the blood back to the core of your body while “diminishing inflammatory response” (Knott *Ice Baths*). Then, once your body warms up again, the “new” blood rushes back into the damaged muscles, bringing nutrients needed to repair them and quickly taking away the waste byproducts made through straining muscles in exercise. So, in theory, the recovery process is sped up. Another theory is that ice baths numb your nerves, so you can’t feel the soreness of your muscles, at least for a little while.

One experiment done on rats to test the effects of cold on pain pathways may show another way that cold could help with muscle soreness. It yielded results that show that “the cooling message can block pain signals” (Smith *Cool way to pain relief*). The Gate Control Theory says that there are multiple “gates” along your nerves from their ends to their starts in the brain (*Neurologic Manifestations; New Findings Reported from University of California Describe Advances in Pain*). The “gates” can be blocked though, if they are receiving another message. Cold can be one of these other messages, and so when the pain message comes to that “gate” (which could be common to many different nerves from different parts of the body), the pain message can’t get through it and so your brain never receives it, and you don’t experience it. However this means only that the pain is blocked, and the actual damage done to the
tissue remains, similar to the result of NSAIDs. According to a pamphlet on DOMS by the American College of Sports Medicine, ice pack application to sore muscles may reduce some symptoms of DOMS (like inflammation and pain) but will not help heal the damage done to the tissue nor help with reduced function. So ice baths, in theory, help block the pain of the damaged muscles, but do they help in healing them?

One research experiment done at the University of New Hampshire by Naomi Crystal for her masters degree thesis tested the effects of ice baths on muscle soreness (*UNH Research: Post-Run Ice Baths Not Beneficial for Strength, Soreness*). Crystal had forty physically active men run downhill at a 10% grade for forty-five minutes. After that, she made twenty of them hop in garbage containers filled with 5°C (40°F) water and soak for twenty minutes. Then at uniform intervals up to three days after the participants’ run she measured their relative soreness and muscle inflammation. Crystal and the other researchers were surprised to find “no difference in strength or perceived soreness between the subjects who took ice baths and the control group.” There may have been a small reduction in inflammation in the ice bath group, but nothing significant or conclusive. Based on her results, Crystal suggests saving ice baths for tournament situations, since their benefits haven’t been proven and they are time-consuming, but that she is “not convinced that it doesn't help at all.”

Another study done in Melbourne, Australia also found little difference between subjects who took ice baths (three one-minute baths in this experiment) and those who took the same length of bath in tepid water (Sellwood, Brukner,Williams, Nicol and Hinman *Ice-water immersion and delayed-onset muscle soreness: a randomised*
After performing quadriceps exercises on the non-dominant leg, half of the forty subjects, who were in randomized groups, took a set of ice baths and the other half took tepid baths. The subjects were blind on which bath they were going to take and did not know which method had supposed beneficial effects. The investigators were blind on which group they were working in, and whether that group was going to take the ice or tepid-water bath. Like the UNH experiment, there were no statistically significant differences in any of the markers of DOMS in the ice group compared to the control group. However, pain actually increased in the ice-bathers at the 24-hours-after mark. The researchers are unsure why, but one possible explanation they put forward is that the ice bath group “experienced a significant painful stimulus at the time of immersion,” which could cause them to be more sensitive to pain for a time afterward. Neither of these studies included athletes though, as the Melbourne scientists pointed out in their experiment, and they acknowledge that “it is possible that different results would be obtained in a group of elite athletes.”

Much of the research that has been done matches the results of the two experiments discussed here. Oddly, the results are deemed “inconclusive”. The lack of a standard ice bath protocol and varying exercises are blamed for this status. But the results aren’t inconclusive: they tell us that ice baths probably don’t do anything to heal our damaged muscle tissue. What’s inconclusive, as usual, are the people and their claims. Scientists working with rats suggest cold can inhibit pain signals from making their way to our brain. Scientists working with people say that ice baths don’t show any signs of lessening the effects of DOMS but aren’t convinced the treatment is useless. Then there are the numbers of elite athletes who swear by their recovery benefits.
Maybe it is simply a classic case of the Placebo affect and ice baths seem to heal only because we think they will. Whatever the case, science and sports can’t seem to agree.

In a time when medical researchers are looking for the cure to cancer and AIDS, testing the effectiveness of ice baths seems a bit trivial. But people, myself included, are obsessed with how the human body works and how we can manipulate it to improve its performance. For athletes, an ice bath is not just a treatment, it’s fine-tuning and restoring the body we put so much work into. That is why people study ice baths. Because little things make a big difference.
Bibliography:


