



Sodium Bicarbonate Supplements and Exercise Performance

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Sodium bicarbonate, also known as baking soda, is a popular household product.

It has many uses, ranging from cooking to cleaning to personal hygiene.

However, sodium bicarbonate may also provide some interesting health benefits.

Many athletes and gym-goers use it to help them perform during intense training.

This detailed guide explains everything you need to know about sodium bicarbonate and exercise performance.

What is Sodium Bicarbonate?

Sodium bicarbonate has the chemical formula NaHCO_3 . It's a mildly [alkaline](#) salt made up of sodium and bicarbonate ions.

Sodium bicarbonate is also known as baking soda, bread soda, bicarbonate of soda and cooking soda. It is commonly found in nature, dissolved in mineral springs.

However, it is best recognized as the white, odorless, non-flammable powder you can find in your local supermarket.

Bottom Line: Sodium bicarbonate is best known as baking soda. It is an alkaline salt, easily found in its white powder form in most supermarkets.

How Does Sodium Bicarbonate Work?

To understand how sodium bicarbonate works, it is helpful to first understand the concept of [pH](#).

How pH Affects Exercise Performance



In chemistry, pH is a scale used to grade how acidic or alkaline (basic) a solution is.

A pH of 7.0 is considered neutral. Anything lower than 7.0 is acidic and anything above that is alkaline.

As humans, our pH is naturally close to neutral. It normally stays around 7.4 in blood and 7.0 in muscle cells.

You function best when your acid-alkaline balance remains close to this target, which is why your body has various ways to maintain these levels.

However, certain diseases or external factors can disrupt this balance. One of these factors is high-intensity exercise, also known as [anaerobic exercise](#) (1).

During anaerobic exercise, your body's demand for oxygen exceeds the supply available. As a result, your muscles cannot rely on oxygen to produce energy.

Instead, they must switch to a different pathway — the anaerobic pathway.

Creating energy through the anaerobic pathway produces [lactic acid](#). Too much lactic acid decreases your muscle cells' pH below the optimal 7.0 (1).

This disrupted balance limits energy production and may also reduce your muscles' ability to contract. Both of these effects ultimately lead to fatigue, which reduces exercise performance (2, 3).

How Sodium Bicarbonate Helps Maintain pH

Sodium bicarbonate has an alkaline pH of 8.4 and can therefore raise your blood pH slightly.

Higher blood pH allows acid to move from muscle cells into the bloodstream, returning their pH to 7.0. This enables the muscles to continue contracting and producing energy (1, 4).

Scientists believe this is the primary way that sodium bicarbonate can help you exercise harder, faster or for longer (1, 2, 5).

Bottom Line: Sodium bicarbonate clears acid out of muscle cells, helping restore an optimal pH. This may decrease fatigue and increase performance.

How Does Sodium Bicarbonate Affect Sports Performance?

Scientists have examined how sodium bicarbonate affects exercise performance for more than 8 decades.

Not all studies published to date show the same effects, but the majority agree that it is beneficial (5).

Sodium bicarbonate is especially helpful for high-intensity exercise that lasts between 1 and 7 minutes and involves large muscle groups (2, 6, 7).



Additionally, most improvements seem to take place near the end of a workout. For example, a recent study observed a 1.5-second performance improvement in the last 1,000 meters of a 2,000-meter (1.24-mile) rowing event (8).

The results are similar for cycling, sprinting, swimming and team sports (6, 9, 10).

However, the benefits can vary from person to person. They may also depend on the type of activity, gender, personal tolerance and training level (2, 6, 9, 10, 11, 12).

Finally, only a few studies have examined how sodium bicarbonate affects endurance exercise, and not of them all found benefits (13, 14, 15).

More research is needed to explore this topic before recommendations can be made.

Bottom Line: Sodium bicarbonate may help improve performance in the later stages of high-intensity exercise. However, more research is needed.

How Does it Affect Interval Training?



Interval training is when a person alternates between intense and less-intense exercise during a single session.

Some examples of this type of training include forms of running, cycling, rowing, swimming, Olympic weightlifting and CrossFit.

Studies that looked at this type of exercise found that sodium bicarbonate helped prevent decreases in performance (2, 16, 17).

This generally led to overall improvements of 1.7–8% ([18](#), [19](#), [20](#), [21](#)).

Interval training is very common in many sports, and studies find that sodium bicarbonate intake can benefit judo, swimming, boxing and tennis ([22](#), [23](#), [24](#), [25](#)).

Finally, the ability of sodium bicarbonate to help you push through the final stages of your workout may also improve your workout results.

For example, participants who took sodium bicarbonate during an 8-week interval-training program had cycled for 133% longer by the end of the study period ([26](#)).

Bottom Line: Sodium bicarbonate likely improves the body's ability to perform during interval training, which may benefit performance in many sports.

Effects of Sodium Bicarbonate on Muscle Strength and Coordination

Sodium bicarbonate may also help increase strength.

In one study, experienced weightlifters who took sodium bicarbonate 60 minutes before a workout were able to do 6 more squats in their first of three sets ([27](#)).

This suggests that sodium bicarbonate can enhance performance, especially at the beginning of a session ([27](#)).

In addition, sodium bicarbonate may also benefit muscle coordination.

For example, one study found that it helped maintain tennis players' swing accuracy. Another study found similar benefits for boxers' punch accuracy ([24](#), [28](#)).

These outcomes suggest that sodium bicarbonate could have effects on the brain, but more research is needed to figure out exactly how this works.

Bottom Line: Sodium bicarbonate may improve muscle coordination and increase strength. It could also increase the number of heavy-weight repetitions you can do at the gym.



Other Health Benefits of Sodium Bicarbonate

Sodium bicarbonate may benefit your health in other ways as well. For example, it:

- **Reduces heartburn:** Sodium bicarbonate is a common ingredient in antacids, which are often used to reduce heartburn and treat stomach ulcers ([29](#), [30](#)).
- **Promotes dental health:** Toothpaste containing baking soda seems to remove plaque more effectively than toothpaste without it ([31](#)).
- **Improves response to cancer treatment:** Sodium bicarbonate may help improve response to chemotherapy. However, there are no human studies on this ([32](#), [33](#), [34](#)).
- **Slows down kidney disease:** Sodium bicarbonate treatment in people with kidney disease

may help delay a decline in kidney function (35).

- **May relieve insect bites:** Applying a baking soda and water paste to insect bites may decrease itching. However, no scientific studies have been conducted.

Bottom Line: Sodium bicarbonate may help improve digestion, dental health and itching from insect bites. It may also benefit patients with kidney disease or those undergoing chemotherapy.

Supplements and Dosage Instructions

Sodium bicarbonate supplements can be found in capsule or tablet form.

You can also purchase it as plain baking soda powder.

The expected benefits remain the same, regardless of which supplement form you choose.

Most studies agree that a dose of 90–135 mg per pound (200–300 mg/kg) of body weight produces benefits, and it should be taken 60–90 minutes before exercise (5).

However, taking sodium bicarbonate so close to exercise can cause stomach problems for some people. If this is the case for you, consider starting with a smaller dose, such as 45–68 mg/lbs (100–150 mg/kg).

You may also find it helpful to take your dose earlier than 90 minutes before exercise.

For example, one study showed that taking 90–135 mg/lbs (200–300 mg/kg) 180 minutes before exercise was just as effective, but decreased stomach problems (36).

You can also decrease side effects by taking it with water or a meal (11).

Finally, splitting your sodium bicarbonate dose into 3 or 4 smaller doses and spreading them over the day may also help improve your tolerance. Just keep in mind that the effects last only up to 24 hours after the last dose (37, 38).

Bottom Line: Sodium bicarbonate can be found in powder, pill or capsule form. Dosages of 90–135 mg/lbs (200–300mg/kg) should be taken up to 3 hours before exercise or as 3 or 4 smaller doses spread over the day.



Safety and Side Effects

Sodium bicarbonate is considered safe when taken in the dosages recommended above.

Larger doses may severely increase blood pH. This is dangerous and can disturb your heart rhythm and cause muscle spasms (39, 40).

In addition, when sodium bicarbonate mixes with stomach acid, it produces gas. This may cause abdominal pain, [bloating](#), nausea, diarrhea and vomiting (1, 41).

Not everyone will experience these side effects. The severity of symptoms can vary based on the amount taken and personal sensitivity (42, 43).

Consuming sodium bicarbonate can also raise your blood sodium levels, which may increase blood pressure in some people.

In addition, large amounts of sodium can make your body retain water. While increased hydration could be useful for those exercising in the heat, it may be disadvantageous for those competing in weight-category sports (5).

Finally, sodium bicarbonate is not recommended for women who are pregnant or breastfeeding. Nor is it suggested for people with heart disease, kidney issues or a history of electrolyte disturbances such as aldosteronism or Addison's disease.

Bottom Line: Intake of sodium bicarbonate is generally considered safe when taken in the recommended dosages. However, it may cause unpleasant side effects and is not recommended for everyone.

Take Home Message

Taking sodium bicarbonate is a safe and reliable way to increase exercise performance, especially in high-intensity and interval activities.

It may also increase strength and help maintain coordination in tired muscles.

That being said, this supplement does not work for everyone. The only way to find out if it will work for you is to give it a try.

