

Ketones Combat Inflammation and Improve Metabolic Function

Analysis by [Dr. Joseph Mercola](#)

✓ Fact Checked

STORY AT-A-GLANCE

- › Ketones are water-soluble fats that aid in tissue healing. They are also very helpful in cases of viral infections such as COVID-19, as they reestablish cellular homeostasis, provide rapid energy, recharge your antioxidants and control oxidation within the cell
- › Ketones provide cells with an immediate source of energy, allowing them to produce more ATP, which they may need to function when in a state of higher activity due to stressors
- › Ketones increase nicotinamide adenine dinucleotide phosphate hydrogen (NADPH), a reducing agent and nucleotide co-factor that improves your body's ability to use antioxidants
- › Ketones also suppress inflammatory pathways present as a result of an infection; they elevate NAD⁺, which in turn upregulates SIRT genes, SIRT3 in particular, that directly control inflammation
- › Baking soda and Alka-Seltzer Gold help squelch excessive inflammation by immediately neutralizing peroxynitrites, which are among the most damaging free radicals there are, and work synergistically with ketones to preserve bone and prevent the loss of muscle

This article was previously published November 22, 2020, and has been updated with new information.

In this interview, Dr. William Seeds, an orthopedic surgeon, reviews how to optimize your metabolic function, improve cellular efficiency and make you more resilient against respiratory viruses using ketones – a topic previously discussed in my interview with Travis Christofferson, who wrote the book "Ketones: The Fourth Fuel."

"My science background has been cellular molecular biology and biochemistry, so that's something I've been deeply involved with for the last 35 years," Seeds says.

"It's parlayed into orthopedics, my specialty, because of tissue healing and optimizing cell efficiency and the flexibility of the cell to improve tissue healing in what we do surgically. So, it's always played an integral role in what we've tried to do to optimize patient outcomes."

How Ketone Esters Control Inflammation

Ketones are water-soluble fats that have powerfully beneficial metabolic benefits and also aid in tissue healing. Ketone esters are a convenient way to increase ketones and are helpful in cases of viral infections such as COVID-19, as they reestablish cellular homeostasis, provide rapid energy, recharge your antioxidants and control oxidation within the cell.

"We're looking to reestablish the homeostasis of the cell, which is basically the redox of the cell, and that is very important in controlling an inflammatory state like COVID-19.

The premises behind what these ketone esters do is they have the ability to give the cell an immediate energy source that doesn't utilize a lot of energy to use it. This helps a cell produce more ATP, more energy, that it may need to function where it is in a higher state of activity because of its stressors it's working against."

How Ketones Improve Antioxidant Levels

Ketones also increase nicotinamide adenine dinucleotide phosphate hydrogen (NADPH), a powerful metabolic co-factor that improves your body's ability to recharge antioxidants like superoxide dismutase, catalase, glutathione peroxidase and hexokinase-1 to their functional state by donating an important reducing electron.

NADPH, in my view, is probably one of the most important biomolecules in your body, right up there with NAD⁺ and ATP. It is the primary way your body recycles its antioxidants. It essentially transfers electrons to them to help reduce excessive oxidative stress.

This is important because once those antioxidants are used, whether produced endogenously or taken exogenously in a supplement, they no longer work. They need to be recharged, which is what NADPH does. This explains why many studies that have attempted to show benefit from taking high dose antioxidants fail.

When antioxidants are taken as supplements they have the potential to indiscriminately suppress beneficial free radicals, but when you recharge antioxidants with NADPH, your body is able to selectively and wisely discriminate between the specific free radicals you want eliminated. There are beneficial free radicals, such as nitric oxide, that you don't want to eliminate. Seeds agrees, adding:

"The key is understanding that you're benefiting your endogenous antioxidant system versus exogenously taking supplements that are potentially reducing your equivalents. Your cells are inherently intelligent and understand how to utilize these ratios of NADP over NADPH and NAD over NADH.

It's giving the cell back the ability to become efficient and flexible. As you reduce glutathione peroxidase, it goes out there and takes care of superoxide or any other type of possible free radical.

Then that will take those electrons but then it has to be changed again, it has to be reduced again to be active and that is the critical part of understanding this – especially in states of high demand, like COVID-19, where you've got, for instance, the alveolar type 2 cells that are highly metabolically active that are

producing superoxide dismutase in the lung area that needs to work against the free radical process produced by cytokine storm and so forth.

You have to have the ability to constantly provide that NADPH or you're in trouble. Whether it's a cytokine storm or an increased oxidative state, this is how we get into trouble and how this leads to metabolic diseases, immune diseases and so forth."

Ketones Suppress Proinflammatory Pathways

In addition to increasing NADPH, ketones also suppress inflammatory pathways present as a result of an infection. Infection initiates an inflammatory cascade of proinflammatory cytokines. One of the benefits of ketone augmentation, either endogenous or exogenous, is that it suppresses potent proinflammatory pathways like NLRP3.

As explained by Seeds, the NLRP3 process is all about activation of the inflammasome. NF kappa B is a transcription factor in the nucleus of the cell responsible for initiating the production of proinflammatory cytokines such as interleukin-1 beta, interleukin-6 and TNF alpha. The overproduction of these cytokines by your immune system is what results in a proinflammatory state.

“ Ketones have been absolutely a wonderful tool for us as physicians to be able to utilize early on, when people are feeling that chest tightness and having some early respiratory changes. We've done it also on the backend of COVID-19, where people who have been treated are still having respiratory and fatigue issues. ~ Dr. William Seeds ”

In addition to boosting NADPH, ketones can also elevate NAD⁺, which in turn upregulates SIRT genes, SIRT3 in particular, that directly control inflammation. SIRT3 deacetylates inflammasome and decreases the production of pro-inflammatory cytokines.

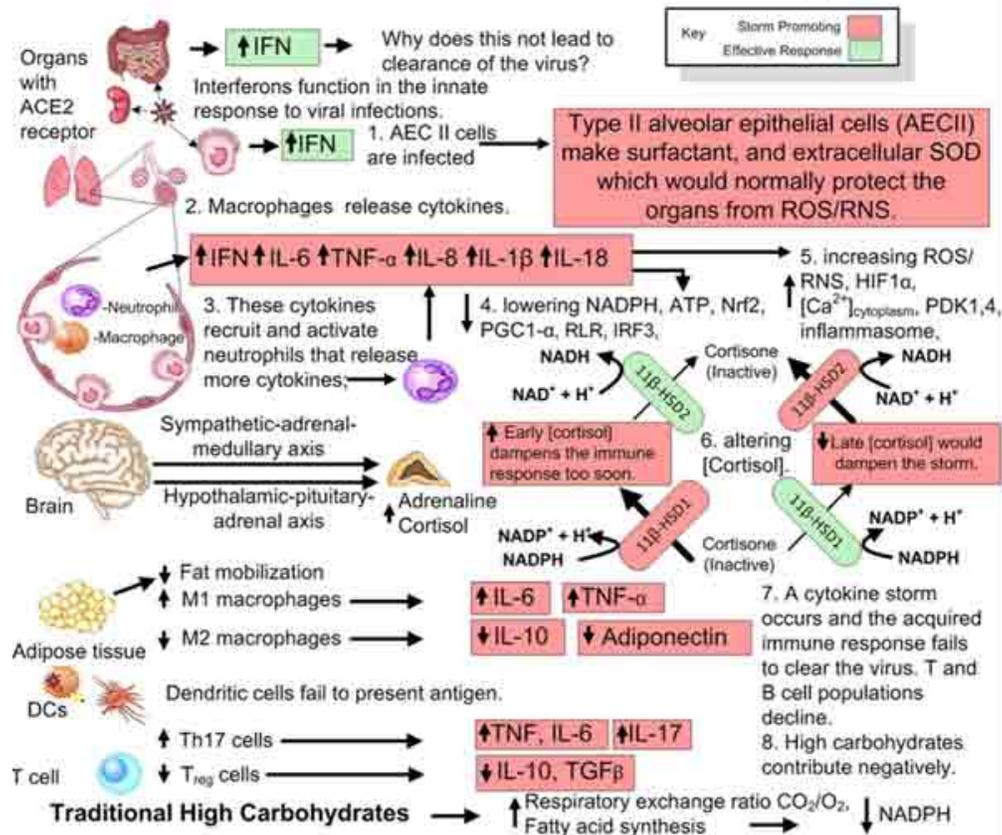
"These proinflammatory agents we're talking about, interleukin-1 beta, tumor necrosis factor alpha and interleukin-6, are necessary for normal cell activity but higher levels are what need to be controlled. So, we're giving the cell the nutrition it needs to make intelligent decisions of how to utilize what it has to control the environment when the cells is getting out of its homeostatic pattern."

In addition to SIRT3, SIRT1 and SIRT2 are also important, and they tend to be activated by beneficial nutrients that we take in our diets, such as resveratrol. However, SIRT1 is useless unless NAD⁺ is high enough. And, as explained by Seeds, when you upregulate SIRT1, you also upregulate AMPK, which in turn improves mitochondrial biogenesis.

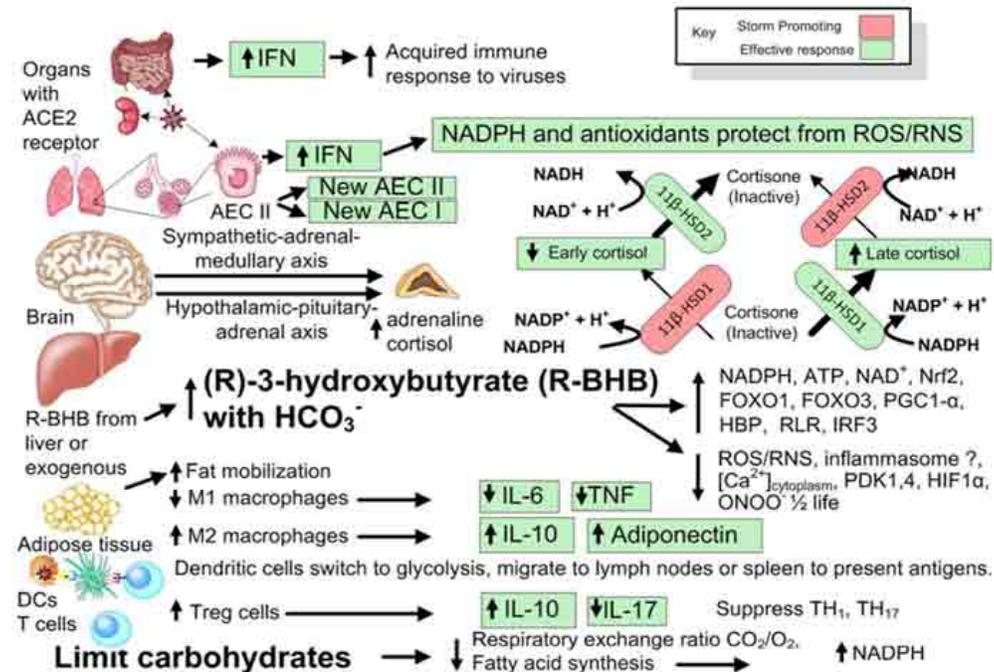
SIRT2, meanwhile, is activated by a polyphenol flavonoid called quercetin. I believe quercetin may be a superior alternative to hydroxychloroquine because not only does it act like a zinc ionophore to increase zinc levels inside the cell but it also activates SIRT2 and has beneficial effects on inflammasome.

The two graphics below are from the paper Seeds wrote, describing the effects of metabolic therapy on COVID-19.¹

COVID-19 Without Metabolic Therapy



Metabolic Therapy and COVID-19



Exogenous Ketone Esters for Respiratory Infections

There are strategies to boost your endogenous ketone levels – such as following a cyclical ketogenic diet and taking C8 (caprylic acid) MCT oil – which is what I prefer. This typically takes more time and commitment but is far less expensive, as ketone esters are typically about \$1 per gram and a therapeutic dose can range from 5 to 25 grams.

Seeds typically uses exogenous ketones such as 1,3-butanediol beta-hydroxybutyrate, which is available in products like KetonAid. This strategy has high compliance and helps you achieve more rapid change in ketone levels and ketosis, and allows for greater precision but is costlier.

"All you need is 5 grams to elevate your endogenous production of almost 1 millimole (mmol/L) of ketosis," Seeds says. "If you [take], let's say 25 grams, you'll get that to 3 to 5 mmol/L ... that will be around for about three to four hours. We believe that range, anywhere above 1 mmol/L is going to be effective initially, to see those changes [in] NADPH, NAD and the inflammasome action.

Now, in our treatment of people that are directly in a COVID-19 situation where we're trying to treat respiratory problems and want a higher millimole concentration, we're going to use the 25 mg [dose] to get that 3 to 5 mmol/L concentration.

What we're truly working on is relieving that bronchial constriction and working on changing the calcium balance of that excitation coupling that's happening with the muscle around the bronchials. That's why the ketone esters have been so effective for us because we get a very quick improvement in that bronchial dilatation.

That's been absolutely a wonderful tool for us as physicians to be able to utilize early on, when people are feeling that chest tightness and having some early respiratory changes. We've done it also on the back end of COVID-19, where people who have been treated are still having respiratory and fatigue issues."

Through his peptide society, the SSRP Society,² he's been able to work with hundreds of U.S. doctors, describing these protocols and how exogenous ketones can be used in early treatment of COVID-19, and as a prophylactic. In many cases, a patient's respiratory status can be improved within minutes.

The use of ketones is one of three interventions that I'm convinced can have nearly immediate benefit. The other two are molecular hydrogen and nebulized hydrogen peroxide. Each one of these can provide near-miraculous benefits in a very short amount of time.

Key Notes on MCT Oil and Carb Intake

We also discussed the use of C8 caprylic acid in greater depth in the interview, which is the most effective form of MCT oil, so for more details, please listen to the interview. We also discuss the use of ketone esters in professional athletics.

One fascinating fact brought up by Seeds is that they now have evidence showing that taking C8 MCT oil about 20 minutes before radiation exposure, such as an X-ray or flying in a commercial aircraft, can inhibit 100% of the radiation damage.

Another important aside is that when you take MCT oil or ketone esters, their efficacy will be significantly increased if you cut down on carbohydrates. There's a big difference in the blood ketone levels you can achieve taking either of them with a high-carb diet, a low-carb diet or when fasting. Fasting will raise your ketone blood levels the most.

Lowering Inflammation With Baking Soda and Alka-Seltzer Gold

Seeds also segues into a discussion about how good old-fashioned baking soda and Alka-Seltzer Gold can be used to squelch excessive inflammation at the molecular level, as bicarbonate immediately neutralizes peroxynitrites, which are among the most damaging free radicals there are. Seeds summarizes a typical regimen:

"I like the Alka-Seltzer Gold – it has to be that specifically, as it doesn't have the aspirin in it. I'll have people take it just to build up their bicarb level. Take two tabs in the morning, two tabs in the middle of the day and two tabs at night. I'll have them do that for about three days to a week, and then I have them go down to just doing two tabs a day.

If you're using baking soda by itself, I'll have people start with a half a teaspoon about every three hours. I'll have them do six doses a day for a few days, and then go to a full teaspoon, three times a day for a few weeks ... That's been an easy prophylaxis, and we utilize bicarb in many other aspects too, in immune diseases and so forth."

While simple baking soda (sodium bicarb), as Seeds recommends, will work, I personally use and recommend using potassium bicarb. You can purchase it inexpensively in pound quantities at nuts.com.

The key to using it effectively is to pick up some litmus pH paper and regularly monitor your urine. Ideally, your pH should be about 7. Without the bicarb it will likely be 6 or even lower. I use about one-half teaspoon three to four times a day based on my urine pH.

This is a powerful strategy I would encourage nearly everyone to adopt as by keeping your urine pH around 7 with the bicarb you will avoid having to neutralize the acidity with either amino acids from your muscles or calcium and other minerals from your bones. This is a simple inexpensive habit that can go a long way to improving your health

Bicarbonate Improves Cellular Power Output

Bicarb also works well together with ketone esters, as the bicarbonate improves the power output of the cell. This can be particularly useful for athletes. Seeds explains:

"It takes it to a new level. Bicarbonate absolutely improves the power output of the cell, of the muscle, just based on improving the ability to work against the buildup of lactic acid over time. It's just improving [athletes'] ability to perform

longer, and when you combine ketones and bicarbonate, you've all of a sudden changed the playing field.

You're still getting the signaling of that lactic acid process. You're not affecting what the lactic acid is important for in the brain, because that's what's going to improve the increase in insulin for you also. The key here is understanding that you're not changing signaling. All you're doing is controlling the pH of the cell ...

The signaling is of utmost importance for improving insulin to improve the utilization of glucose. So, it's just a really amazing circle, and if you understand these pathways, you've got some tremendous tools that are WADA [World Anti-Doping Association] approved. There are no stipulations against any of this type of stuff.

When we're giving bicarb, that's going to challenge the ionic change of the hydrogen ions that are going to be produced. It's going to be able to challenge that instead of going into the muscle and taking glutamine, and then to the liver to produce ammonia to balance out the pH. And so, we're preserving muscle. We're preserving bone.

Let me take this a step further, if I can. Diets today are set up to destroy that acid base metabolism and over time – what I just described – is what's happening. You get a slow leak of loss of amino acid from the muscle.

We've studied it based on nitrogen produced in the urine, and the kidney has to make up for this acid buildup because of the protein buildup. It has to deal with it by taking amino acids from muscle or alkali from bone.

So, we've got this strategy of utilizing bicarb that changes that. It stops osteopenia. It stops sarcopenia, and on top of it, it's got these other aspects of improving cell metabolism."

More Information

To learn more about Seed's practice and how he's revolutionizing medicine with peptide therapy, see [Seeds.md](#). He's also written a book on peptide protocols – which is a discussion we did not cover in this interview – and how they can improve metabolic function and cellular efficiency. "Peptide Protocols: Volume One" was released in August 2020, and can be found on Amazon.com.

Sources and References

- ¹ [COVID-19: Proposing a Ketone-Based Metabolic Therapy as a Treatment to Blunt the Cytokine Storm \(PDF\)](#)
- ² [Seeds.md](#)