

Polyamines & Polymethoxyflavones for Reducing Body Fat

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Hope springs eternal and people would love there to be a magic pill that melts fat away like magic. Spoiler alert: it doesn't exist. That being said, there are still nutraceuticals that can help give overweight people an edge while fighting the battle of the bulge. In this article I'll be highlight research and the potential benefits associated with the use of polyamines from rice germ extract, and polymethoxyflavones from black ginger extract. Let's begin with polyamines.

POLYAMINES

Polyamines, including spermidine, spermine and putrescine, are synthesized in every living cell and are contained in many foods. They have many physiological activities, such as antioxidant and anti-inflammatory properties, cell and gene protection, and autophagy activation. They also have multiple demonstrated applications for health and wellness, including healthy aging^{1 2 3 4}, hair health^{5 6}, cognitive health^{7 8 9}, and hormonal health¹⁰. In this article, we're going to explore research on polyamines (especially spermidine) in relation to weight loss/fat loss. Let's start with a quick review of autophagy, which is relevant to the discussion.

Autophagy

Autophagy (pronounced "ah-TAH-fah-gee") is the body's process of breaking down old and damaged cell parts. This allows cells to disassemble junk parts and repurpose the salvageable components into new, usable cell parts, while discarding the unusable or unneeded parts. In addition, autophagy works as cellular *quality control*. Essentially, an excess of junk components in a cell takes up space and can slow or prevent a cell from functioning correctly. Autophagy helps eliminate cellular clutter, optimizing cellular performance. Spermidine has been shown to increase autophagy^{11 12 13 14}.

Spermidine in weight loss

So, what does autophagy have to do with weight loss? Just this. Spermidine plays a vital role in enhancing metabolism and weight loss through mechanisms such as alteration of intestinal barrier function and gene expression, enhancement of energy metabolism, glucose and lipid metabolism, and autophagy.¹⁵ Now let's look at some of these other mechanisms of spermidine-related weight loss

Intestinal barrier function

Obesity is associated with impaired intestinal barrier function and dysbiosis of the gut microbiota. Research has demonstrated that spermidine administration results in significant alteration of microbiota composition and function, conferring protection against obesity in both humans and mice. Spermidine supplementation was shown to result in a significant loss of weight and improvement in insulin resistance in diet-induced obese mice. These effects were associated with the alleviation of metabolic endotoxemia and enhancement of intestinal barrier function, which might be mediated through—you guessed it—autophagy.¹⁶

Adipocyte differentiation

Adipocytes are fat cells. During adipocyte differentiation, preadipocytes convert to adipocytes/mature fat cells which allows for the accumulation of fat to fill up the adipocytes. A study¹⁷ with in-vitro and in-

vivo components was conducted in which the polyamines putrescine, spermidine, and spermine were cultured with a preadipocyte cell line. Results were that lipid accumulation was significantly suppressed by spermine. Likewise, the body weight and fat of obese mice induced with a high-fat diet were reduced by oral ingestion of spermine. In conclusion, oral supplementation of spermine was shown to prevent obesity in mice through inhibition of adipocyte differentiation. So does that mean you should supplement with spermine instead of spermidine? You could, but it's not necessary. Human clinical research¹⁸ indicates that dietary spermidine is presystemically converted into spermine, which then enters systemic circulation.

Fat burning via brown adipose tissue

While white adipose (i.e., fat) tissue is specialized for fat storage, brown adipose tissue has a high concentration of mitochondria and is specialized for burning fat. People have a small percentage of brown fat in their bodies compared to white fat.¹⁹ A study²⁰ was conducted to investigate the effects of oral spermidine on brown adipose tissue (BAT) and skeletal muscle as well as its roles in counteracting obesity and metabolic disorders in mice fed a high-fat diet. Results showed that weight gain, insulin resistance, and increased liver fat were reduced by spermidine, accompanied by an alleviation of white adipose tissue inflammation. Oral spermidine was found to promote brown adipose tissue activation and metabolic adaptation of skeletal muscle.

Another study found that spermidine supplementation in mice significantly promoted the activation of adipose tissue thermogenesis (i.e., fat burning), and markedly enhanced glucose and lipid metabolism in adipose tissues. These results were associated with the activated autophagy pathway (no surprise there).²¹

Weight reduction/obesity in mice

Now that we understand some of the mechanisms, it is no surprise that other research has demonstrated that spermidine is capable of reducing body weight and/or reducing obesity in mice fed high fat or high sucrose diets:

- Body weight and blood glucose were lower in mice given oral spermidine supplementation while being fed a high sucrose diet, compared to mice given the same diet without spermidine.²²
- Daily injections of spermidine in mice counteracted high-fat diet-induced obesity by increasing lipolysis (i.e., fat breakdown) in visceral fat.²³
- Oral spermidine administration lowered fat mass and plasma lipids in high-fat diet-induced obese mice, as well as reducing the increase in liver fat and reduced adipose tissue inflammation and enhancing gut barrier function.²⁴

Natural spermidine is better than synthetic

When choosing a spermidine material to use in your formula, natural is better than synthetic. One reason for this is that synthetic spermidine does not come with the other polyamines that normally accompany spermidine in nature. This is significant since the presence of the other naturally occurring polyamines provides a recycling loop whereby the body can produce more spermidine, not just the amount given in the daily dose itself.²⁵ Also, natural spermidine and the other polyamines have been present in our food supply for millennia and has a very good safety profile as a result. Miricell™ rice germ polyamines provide an excellent source of spermidine with other polyamines.

POLYMETHOXYFLAVONES

Black ginger (*Kaempferia parviflora*), a plant in the Zingiberaceae ginger family, is a traditional herbal medicine of Thailand. Its pharmacological properties include anti-obesity, anti-inflammatory, aphrodisiac and more. Its active components are polymethoxyflavones. Research demonstrates that black ginger polymethoxyflavones offer a range of benefits, including fat reduction^{26 27}, promoting physical fitness^{28 29}, and supporting sexual health in men^{30 31}. As with polyamines, in this article we're going to explore research on black ginger polymethoxyflavones (BGP) in relation to fat loss.

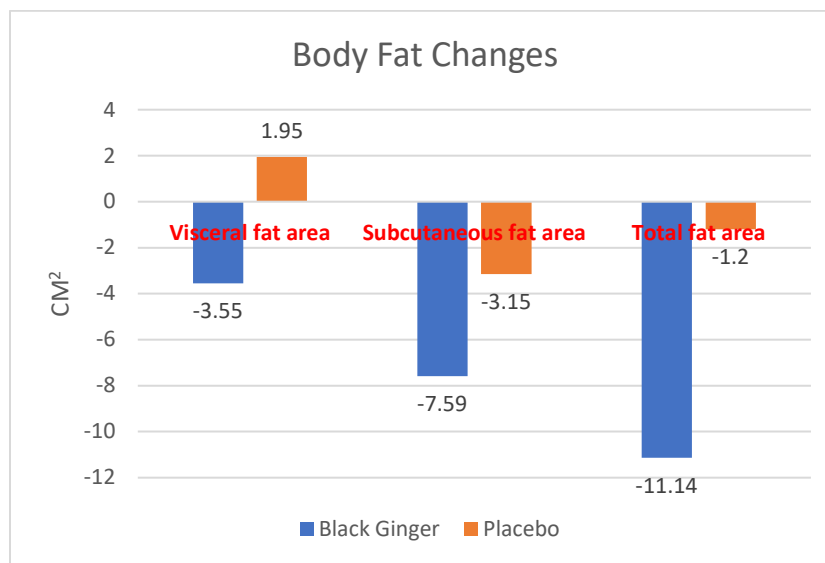
Fat burning via brown adipose tissue

Let's start with a discussion on the mechanism of action. A 7-week, randomized, single-blind, placebo-controlled, crossover study³² was conducted to examine the acute effects of BGP ingestion on energy expenditure (EE, aka, fat burning) in 20 healthy male subjects (21-29 years) and to analyze its relation to the activity of brown adipose tissue (BAT). Results were that after an oral ingestion BGP (providing 10.48 mg of polymethoxyflavones), EE increased significantly, showing a maximal increase of 229±69 kJ/d at 60 min, while it did not change after placebo ingestion. The results suggest that a single oral ingestion of the BGP can potentially increase EE through the activation of BAT in healthy men.

Human research on fat reduction

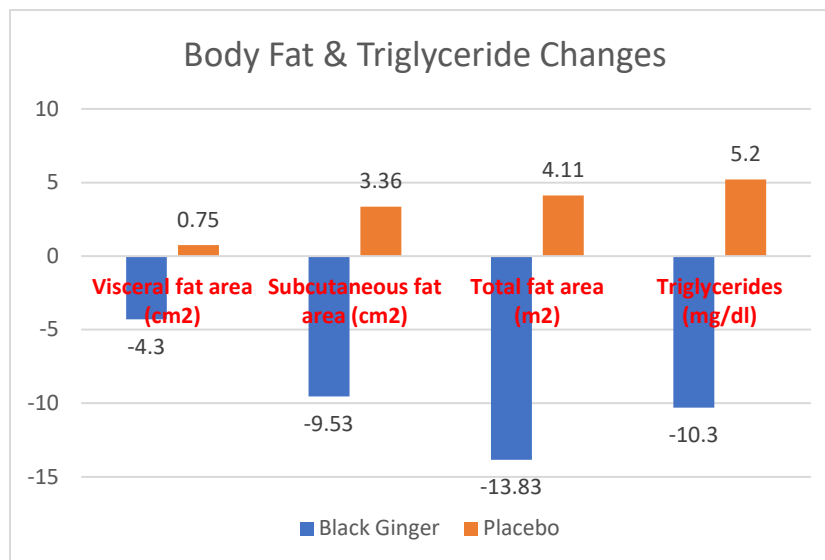
Visceral fat is belly fat found deep within your abdominal cavity. It surrounds important organs, including your stomach, liver and intestines. Research suggests that if you have a potbelly — or are more “apple-shaped” than “pear-shaped”—you may have more visceral fat.

A 12-week, randomized, double-blind, placebo-controlled parallel group study³³ was conducted in 80 overweight adults investigating the effects of BGP on visceral fat. Subjects received either BGP (12 mg polymethoxyflavone per day) or placebo. The primary outcome was a reduction in visceral fat area (VFA), while the secondary outcome was a reduction in subcutaneous fat area (SFA) and total fat area (TFA). Results showed that VFA, SFA and TFA was significantly reduced in the BGP group compared to placebo:



Another 12-week, single-center, randomized, double-blind, placebo-controlled clinical trial³⁴ was conducted to examine the effects of BGP in reducing abdominal fat in 76 overweight and preobese Japanese subjects. Once again, the subjects in each group ingested one capsule of placebo or BGP (12 mg polymethoxyflavones/day) once daily for 12 weeks. Also once again, the primary outcome was

reduction in visceral fat area, with the key secondary outcomes as reductions in subcutaneous fat area and total fat area. Results were, compared with the placebo group, the BGP group exhibited significant reduction in abdominal fat area (visceral, subcutaneous, and total fat) and triglyceride levels after 12 weeks:



BGP availability

Nutraland USA is currently in the process of expanding our offerings to include a high-quality black ginger extract containing a relatively high potency of polymethoxyflavones (perhaps around 36%). That means that only 33.3 mg would be needed to provide the 12 mg clinically tested dose of polymethoxyflavones.

CONCLUSION

Although the weight loss research on spermidine/polyamines is currently limited to animal studies, it is nonetheless quite promising. Future human clinical research on spermidine/polyamines will be most welcome. The human clinical research on black ginger polymethoxyflavones is impressive, and offers an opportunity for brand owners to develop new fat loss/fitness products (or update existing products) to include this extremely impressive nutraceutical.

Note: The information presented in this article is for educational purposes only. It does not constitute recommendations for structure/function claims.

Nutraland USA offers clean, plant-based and sustainable branded ingredients supported by science. Our nutraceuticals are good for you, and good for the planet. For more information about how you can use Miricell™ rice germ polyamines and/or black ginger polymethoxyflavones in your dietary supplements, contact gene.bruno@nutrallandusa.com; 949-988-7615.

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