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Report

Age-Related Metabolic Decline and Weight Gain

By Michael Downey



A mechanism long known to contribute to age-related weight gain is a **decrease in resting metabolic rate**¹ —the number of calories burned when the body is at rest. This can lead to significant **weight gain** —*even if you haven't changed your diet at all.*¹⁻⁴

To make matters worse, **dieting** can exacerbate the problem because it can lead to a further **decrease** in the **resting metabolic rate.**⁵⁻⁷

Obese and overweight individuals have a reduced life expectancy.⁸ They also have a greater risk of many disorders, including heart disease,⁹⁻¹¹ dementia,¹² osteoarthritis,¹³ allergies,^{14,15} and diabetes.¹⁶

Scientists have uncovered several ways to reverse the **decrease in metabolic rate** that makes it so easy to accumulate weight and fat as we age. A double-blind, placebo-controlled study showed results *in as little as 7 days.*¹⁷

The Root of Age-Related Weight Gain

Most people tend to experience a reduction in their metabolic rate as they age, which can lead to the unhealthy accumulation of extra body fat.^{1-4,18,19} A wealth of evidence now suggests that this tendency to pack on pounds over time originates with changes in your body's relationship with calories:

1. With age, your energy expenditure drops due to a decline in **resting metabolic rate.**^{3,4}
2. Aging may also cause a reduction in the conversion of **stored body fat to energy.**²⁰
3. There is an age-related reduction in **fat-free mass** in your body—which means a proportionate loss of this *more metabolically active* and energy-burning muscle tissue.^{2,18,19,21,22}
4. Attempts to lose excess weight trigger a decrease in **resting metabolic rate** — ironically contributing to continued weight gain.⁵⁻⁷



The ideal solution to this problem would be one that restores **metabolic activity** and supports the burning of fat.

Non-resting (active) metabolism uses only about **30%** of total calories, and the generation of body heat requires only about **10%** of calories.² The other **60%** of burned calories comes from your resting metabolic rate.²

So, scientists have known that even just a 2-3% increase in resting metabolic rate could have the effect of reversing age-related weight and fat gain!²³

The challenge was to find a natural way to maintain body weight and resting metabolic rate without the cardiovascular or central nervous system side effects seen with stimulant-associated fat-burning agents.^{17,24}

Researchers initially investigated **DHEA** (*dehydroepiandrosterone*) because age-related decreases in this hormone are associated with increased abdominal fat.²⁵ From there, scientific attention began to focus on one of the many metabolites of DHEA—the chemical compound **β-acetyl-7-oxo-dehydroepiandrosterone**, commonly called **7-Keto DHEA** or simply **7-Keto**.

There were several reasons for great interest in this metabolite:

- Like DHEA, studies showed that average blood concentrations of 7-Keto **decline** with age.²⁶
- To a greater degree than DHEA, 7-Keto was found to **raise metabolic rate** and **promote fat burning** by boosting the activation of three **thermogenic enzymes** that stimulate fatty acid oxidation:
 1. Glycerol-3-phosphate dehydrogenase,
 2. Malic enzyme, and
 3. Fatty acyl CoA oxidase.²⁷⁻³⁰
- Although DHEA's effect on thyroid function is not clear, it is known that 7-Keto increases **thyroid hormones**, which are associated with increased resting metabolic activity.³¹
- Unlike DHEA, 7-Keto is *not* converted into estrogen or testosterone, making it **safer** for use by people with hormone-dependent conditions, such as prostate and breast cancers.³⁰

Also, well-controlled research on healthy, human volunteers found daily administration of 7-Keto to be very well-tolerated.²⁴

So 7-Keto supplements appeared to be a safe and effective answer to the age-related decline of resting metabolic rates.

To verify these benefits, scientists set out to confirm if **7-Keto** supplementation induces an increase in resting **metabolic rate**. They conducted a clinical trial of the most rigorous type...a randomized, double-blind, placebo-controlled study on humans.

What You Need to Know

RESTORE YOUTHFUL METABOLISM WITH 7-KETO

- Aging involves significantly **reduced resting metabolic rate**¹ and a loss of fat-free mass.^{2,18,19,21,22}
- The resulting weight and fat gain increases the risk of numerous problems, including heart disease,⁹⁻¹¹ diabetes,¹⁶ and dementia¹² —**lowering life expectancy**.⁸
- Scientists have now shown that supplementing with **7-Keto**, a DHEA metabolite, can restore resting metabolic rate **in just 7 days!**¹⁷
- In double-blind, placebo-controlled research, 7-Keto supplements were found to produce, compared to placebo, almost **3 times** the weight loss—and over **3 times** the decrease in body fat percentage **within 8 weeks**.^{36,36}



Restoring Resting Metabolic Rate In as Little as 7 Days

Because the age-related decrease in metabolism takes place over many years, scientists needed to find a way to study metabolic slowdown over a shorter period. In order to achieve this effect, they set up a clinical study in which volunteers were placed on a *calorie-restricted diet* —a known trigger for a decreased resting metabolic rate⁵⁻⁷

In this randomized, double-blind, placebo-controlled study, researchers used a *cross-over* design in which a group of overweight volunteers took **7-Keto** during one phase and a placebo during another phase. In this type of study, the subjects

essentially act as their own control group, which produces more reliable observations.

As expected, the metabolic effect of the calorie-restricted diet triggered a decrease in resting metabolic rate of **3.9%** during the placebo phase.¹⁷

However, 7-Keto supplements taken twice daily reversed this **3.9%** decrease and *further* increased resting metabolic rate by **1.4%** above the baseline level—in just **7 days!**¹⁷

This represented an overall increase of **5.3%** in energy consumption—*equivalent to about 96 extra calories burned per day*—but with no change in exercise levels *This indicated that 7-Keto supplements can increase resting metabolic rate—and within a 7-day period!*

The observed **5.3%** increase in resting metabolic rate exceeded the **2-3%** increase that scientists had previously speculated would be sufficient to help reverse *age-related* weight gain.²³

Also, 7-Keto supplements were found in this study to have no cardiovascular or central nervous system side effects.¹⁷ This confirmed earlier research demonstrating that 7-Keto was safe and well-tolerated.^{24, 32-34}

Although this research established the ability of 7-Keto to increase resting metabolic rate—*suggesting it would also help prevent age-related weight gain*—scientists conducted additional placebo-controlled studies in order to measure the precise impact of 7-Keto supplements on weight.

Metabolically Induced Weight Loss



Supplementation with 7-Keto raises resting *metabolic rate*, which in turn would be expected to produce **weight loss**.^{17,23,35} To verify this result, scientists enlisted 30 healthy, overweight adults with an average age of 44.5 years, in a randomized, double-blind, placebo-controlled study. They were randomly divided into two groups.

Half of the participants were given **100 mg** of 7-Keto **twice daily**, while the other half were given a placebo. Both groups followed a diet of **1,800 calories** a day and took part in 60 minutes of exercise training three times per week.

After 8 weeks, the 7-Keto subjects lost an average of **6.34 pounds** versus an average of **2.13 pounds** in the control group. The 7-Keto participants also lost **over 3 times more body fat** than the control subjects—**1.8%** vs. **0.56%**. An increase in *thyroid hormone activity* was observed in the 7-Keto group, which targets fat-burning genes in the mitochondria and adipose tissue. 7-Keto did not adversely affect thyroid function and no negative effects were found.³⁵

Because there were no significant differences between the two groups in terms of overall calorie intake or total calorie expenditure, the study concluded that **7-Keto induces weight loss**.³⁵

Scientists then conducted a *second* randomized, double-blind, placebo-controlled trial to assess the effects of a formulation containing 7-Keto on overweight subjects. The formulation contained no ingredients with proven weight-loss effects except **7-Keto**.

The treatment group received **200 mg a day** of the 7-Keto formulation, while the control group received a placebo. All participants were placed on a weight-reduction diet of **1,800 calories** a day and were monitored in an exercise program. Within 8 weeks, the 7-Keto group lost an average of **4.73 pounds**—compared to **1.58 pounds** lost by the control group. The 7-Keto group also decreased their body mass index (BMI) score by an average of **0.71**, a much greater improvement than the average BMI reduction of **0.01** among the control subjects. 7-Keto was well tolerated and no significant side effects were found.³⁶

As in the previous study, there were no significant differences between the two groups in terms of calories consumed or expended. *These results confirmed that supplementation with 7-Keto produces weight loss.*³⁶

Four More Anti-Aging Benefits

Beyond its ability to reverse the age-related decrease in resting metabolic rate—and ultimately help produce weight loss—7-Keto has been shown to deliver a number of other **anti-aging** dividends, ranging from boosting weakened immune function to improving memory.

Enhanced Immune System

The thymus atrophies after adolescence, shrinking to about **15%** of its maximum size by middle age. Since immune cells called T-cells mature in the thymus, T-cell function decreases with this age-related shrinkage.³⁷ Soon, parts of the **immune system become weakened**, substantially reducing our ability to avoid infections and autoimmune responses.³⁷

Scientists found indications that 7-Keto has immune-boosting effects in an in vitro study of spleen lymphocytes from mice. An immune-suppressing drug was introduced, which as expected, dramatically reduced lymphocyte levels. But when 7-Keto was added, lymphocyte viability increased by **95-117%**. In addition, a measure of *primary immune response* increased by **120-150%**.³⁸

7-Keto was shown in a lab study of human lymphocyte cells to enhance the production of *interleukin-2*.³⁹ Interleukin-2 is an important type of signaling molecule that stimulates the production of various T-lymphocytes, which in turn stimulates production of other immune system agents.⁴⁰ The capacity of 7-Keto to increase interleukin-2 suggested it may offer strong *immune-enhancing benefits* against a wide range of conditions, including major diseases such as cancer and AIDS.³⁹

A team of scientists then exposed mice with compromised immune systems to four weeks of mild, chronic stress. This resulted in a decrease in their white blood cell proliferative response and a decrease in thyroid hormone levels. However, when the mice were given 7-Keto, their white blood cell proliferative response was greatly increased, natural killer cell activity was dramatically enhanced, and thyroid levels increased to normal levels.⁴¹

These intriguing results led to a 7-Keto study on humans.

In a randomized, double-blind, placebo-controlled study enlisting 22 women and 20 men over the age of 65, the treatment group took **100 mg** of 7-Keto **twice daily**, while the controls took a physically identical placebo. After four weeks, subjects in the 7-Keto group showed a significant increase in *immune helper cells*, decrease in *immune suppressor cells*, and increase in *neutrophils*, the first white blood cells to respond to an infection.⁴² (Note that excess levels of **immune suppressor cells** can prematurely turn critical immune functions "off", so suppressing them is of importance in individuals seeking enhanced immune activity.)

Improved Cholesterol Profile

The age-related decline in resting metabolic rate can lead to obesity and an increase in levels of harmful *low-density lipoprotein* or LDL cholesterol.⁴³

When LDL cholesterol increases—and is not offset by a greater increase in *high-density lipoprotein* or HDL cholesterol—it results in a **higher atherogenic index**. This is the ratio of total cholesterol to HDL, and a higher ratio represents a higher risk of cardiovascular disease and heart attack.

Scientists tested the effect of 7-Keto on the cholesterol profiles of 10 human subjects. Volunteers aged 27 to 72 applied a gel containing 7-Keto to their abdominal skin for **5 days** consecutively. This delivered **25 mg** of 7-Keto.

While there was only a very modest decrease in total cholesterol, there was a "strongly significant" improvement in cholesterol composition. Harmful LDL cholesterol levels decreased slightly, and HDL cholesterol levels rose significantly. Together, these changes produced a strong reduction—meaning improvement—in the atherogenic index. There was also an increase in beneficial *apolipoprotein A-1*, a protector of cardiovascular health.⁴⁴

These benefits were observed after administration of just **25 mg** of 7-Keto—a relatively small dose.⁴⁴

Reversed Memory Decline

Normal aging is associated with age-related memory impairment—a decline in various memory abilities that includes a decrease in the ability to encode new memories.⁴⁵ 7-Keto supplementation may be able to reverse this age-related memory loss.

Scientists trained young mice to use a water maze. They then experimentally induced memory loss. A subsequent single injection of 7-Keto—a **24 mg per kg** of body weight (equivalent to **144 mg** for a 165 pound adult)—reversed the memory deficit.⁴⁶

The team then fed 7-Keto to *old* mice that had learned the maze. The 7-Keto mice were able to retain their memory of the maze for the entire **4-week** test period—while old mice not receiving 7-Keto lost their memory of the task.⁴⁶



Clinical studies are still needed to confirm this reversal of age-related memory decline in humans, but the results of these animal studies are encouraging.

General Anti-Aging Benefits

Research conducted on *DHEA* (*dehydroepiandrosterone*)—the hormone that produces 7-Keto as a metabolite—produced a number of general **anti-aging** effects from replacement of age-diminished DHEA levels.

Elderly human volunteers were given **50 mg** of DHEA **daily**. After 3 months, scientists found increased levels of *anabolic growth factor* and greater lean body mass, muscle strength, immune function, and quality of life. Both men and women reported improvements in physical and psychological well-being, energy, mood, sleep patterns, relaxation feelings, and the ability to deal with stress.⁴⁷

DHEA is converted by the body into *androstenedione*, which is then converted into the male and female sex steroid hormones, estrogen and testosterone. This conversion is highly individualized and some people could end up with excess levels of these sex hormones—which could pose a risk if any of those individuals have *hormone-dependent disease*, such as prostate or breast cancer.^{30,48}

Unlike DHEA however, 7-Keto does not trigger higher sex hormone levels.⁴⁴ That means that supplementing with 7-Keto may be a **safer** way for some people to benefit from these anti-aging effects including enhancing the immune system, reducing age-related memory loss, and improving cholesterol profiles.

What You Need to Know

TARGETING UNDERLYING FACTORS: HOW 7-KETO WORKS

Scientists are beginning to uncover the mechanisms of action behind the remarkable ability of 7-Keto to reverse the age-related decrease in resting metabolic rate and to produce various anti-aging benefits.

Liver Enzymes

Scientific studies indicate that 7-Keto powerfully boosts levels of three liver enzymes that result in stimulation of fatty acid oxidation:²⁷⁻³⁰

- Glycerol-3-phosphate dehydrogenase
- Malic enzyme
- Fatty acyl CoA oxidase



These enzymes accelerate a heat-generating process called *thermogenesis*, which promotes the utilization of fat reserves. Because this thermogenic effect reverses the age-related decrease in resting metabolic rate, this may explain 7-Keto's ability to decrease weight and body fat.^{17,29,30}

Thyroid Hormone

Supplementing with 7-Keto results in elevated levels of the *T-3 thyroid hormone*.³¹ Thyroid hormones regulate metabolic activity, which declines with age.¹ This explains another potential mechanism by which 7-Keto triggers reductions in body weight and body fat.^{35,36}

Interleukin-2

7-Keto has been shown to enhance the production of *interleukin-2* in human lymphocytes.³⁹ When interleukin-2 reacts with its corresponding receptor sites on cell surfaces, it stimulates production and differentiation of various T-lymphocytes, which in turn trigger production of other immune agents.⁴⁰ The result is a broad enhancement of the immune system, which is normally weakened by advancing age.^{37,49} Study participants experienced decreased immune suppressor cells and increased immune helper cells.⁴² Supplementation with 7-Keto may fortify defenses against numerous conditions, including killers such as cancer and AIDS.

Summary

Advancing age causes a significantly **decreased resting metabolic rate**.¹ This can lead to age-related **increases in body fat**^{1-4,18,19} along with increased risk of heart disease,⁹⁻¹¹ diabetes,¹⁶ and dementia.¹² Aging individuals often find themselves overweight or obese^{1-4,18,19} —which means **reduced life expectancy**.⁸

Unfortunately, dieting can trigger a further metabolic slowdown.⁵⁻⁷

Fortunately, scientists have found that replenishing the levels of a DHEA metabolite known as **7-Keto** *reverses* the age-related decrease in metabolic rate **in just 7 days**.¹⁷ This translates into reductions in weight and body mass index **in just 8 weeks**!^{35,36}

It would appear those seeking to lower their **calorie intake** would enjoy greater reduction of body fat mass by supplementing with **100 mg of 7-Keto** twice a day.

Best of all, 7-Keto has other anti-aging benefits—including enhancing immune function, reducing age-related memory loss, and improving cholesterol profiles.^{38,43,46}

If you have any questions on the scientific content of this article, please call a **Life Extension®** Health Advisor at 1-866-864-3027.

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