



## Selective Androgen Receptor Modulators (SARMs): Muscle Growth Without Side Effects?

### What SARMs are

Selective androgen receptor modulators (SARMs) are drugs that mimic the effects of testosterone on muscle, but have fewer of its other effects. They stimulate the growth of muscle, but don't greatly affect the prostate gland, erectile function, or secondary sex characteristics such as facial and body hair, enlargement of the voice box, nor have unwanted side effects like acne.

Naturally, bodybuilders have taken an interest in them. SARMs might provide many of the muscle-growth effects of steroids, but without harmful side effects.

### The rationale for SARMs

[As people age, they lose muscle mass](#), and if this goes on long enough, sarcopenia, or muscle-wasting, develops. The only difference between normal muscle loss and sarcopenia is the degree to which muscle has been lost.

Illnesses such as cancer or COPD exacerbate muscle loss, and [bedrest such as hospital stays or at home during an illness exacerbate it](#).

With sarcopenia, elderly and/or ill people become frail, with all that entails for independent living – if someone can't walk or perform the ordinary tasks of daily living, then they need assistance, which may mean a nursing home.

Muscle loss may also exacerbate illnesses; for example, cancer patients who have lost muscle may not be in a condition to take rounds of chemotherapy.

Doctors would like a way to treat muscle loss without the side effects of testosterone, anabolic steroids, or growth hormone. Pharmaceutical companies have been at work and have developed a number of SARMs, at least one of which

has reached Phase 2 clinical trials in humans.

## How SARMs work

Testosterone and their synthetic derivatives, known as anabolic steroids, have both androgenic and anabolic effects.

Androgenic effects are those that relate to being male: body and facial hair, enlarged voice box and deep voice, erectile function, male pattern baldness, production of sperm.

Anabolic effects are those related to growth, especially of muscle and, to a lesser extent, bone.

Testosterone and its derivatives have differing ratios of androgenic to anabolic effects. [Synthetic anabolic steroids](#), for example, may have 10 times the anabolic effect of testosterone.

Hormones such as testosterone work by attaching to receptors on cell membranes, which then activate cellular signals that start a cascade of biochemical events, leading to the ultimate hormonal effect. Hormonal receptors are found on and in cells of a hormone's target tissue.

In the case of testosterone, these receptors are found in many tissues, such as muscle, bone, brain, and the prostate gland.

SARMs *selectively* target certain tissues, mainly muscle. They work on the androgen (testosterone) receptors in muscle, but less so or not at all in other tissues.

In this way, [SARMs](#) have a much higher anabolic to androgenic ratio; they build muscle, but have little effect on specifically androgenic effects such as erectile function or the prostate gland.

As such, SARMs have the potential for use in women as well as men. And in men, they shouldn't produce as much feedback inhibition of the endogenous production of testosterone, so that other male parameters should remain normal.

Clearly, if SARMs were to fulfill their promise, they could be wonder drugs, treating sarcopenia or cancer cachexia (loss of body weight) without side effects.

## Ostarine (enobosarm)

The SARM that has won the most attention and that has proceeded furthest in human trials is enobosarm, also called Ostarine by the company that developed it.

Of the SARMs, bodybuilders have also paid the most attention to Ostarine.

Researchers did a phase II clinical trial on 120 healthy elderly men (over 60

years old, ahem) and women.[1. Dalton, James T., et al. "The selective androgen receptor modulator GTx-024 (enobosarm) improves lean body mass and physical function in healthy elderly men and postmenopausal women: results of a double-blind, placebo-controlled phase II trial." *Journal of cachexia, sarcopenia and muscle* 2.3 (2011): 153-161.]

Average age of both men and women was in the early to mid 60s (depending on treatment group), and the study was double blind, meaning neither the researchers nor the patients knew whether they were getting a placebo nor the dose of Ostarine.

The findings included an increase in muscle mass, and adverse effects were similar to placebo. The greatest increase in muscle was seen at the highest dose of 3 mg a day.

The group taking 3 mg a day saw an increase in lean mass of about 3%, or about 1.2 kg. Increases in lean mass at lower doses were not significant.

Fat mass decreased by about 0.3 kg at the highest dose, and again the changes at lower doses were non-significant.

One subject was forced to discontinue the drug due to an increase in liver enzymes, which returned to normal after cessation of use.

Interestingly, insulin resistance decreased by ~27% at the highest dose, and triglycerides dropped also, which is a beneficial effect. It's possible greater muscle and less fat mass contributed wholly or partly to this effect.

Also notable is that while total testosterone decreased in men, so did sex hormone binding globulin (SHBG), so that free (active) testosterone did not significantly decrease. This would be expected to preserve endogenous androgenic function. No change in testosterone was seen in women.

All in all, the researchers were pleased with the trial, noting both effectiveness and a relative lack of adverse effects. Worth noting is the conflict of interest statement: all of the researchers are employees of and have stock options in GTx, Inc., the maker of Ostarine.

## Questions

Ostarine clearly works at increasing muscle mass and slightly decreasing fat mass, and seems to have a low incidence of side effects.

Will it work for bodybuilders?

The subjects in the study did no resistance training. If they had done so, they probably (in my opinion) could have gained more than 1.2 kg (2.6 lbs) of muscle in the 12 weeks of the trial.

So if someone already lifts weights, would the effect of Ostarine be additive? That's unknown, but unless the person taking it has low testosterone or some other condition, then perhaps not.

The dose that yielded good results in this study was 3 mg a day, and to my knowledge Ostarine has not been tested at higher doses.

Yet some bodybuilders advocate as much as 75 mg a day.

At such a high dose, this could, maybe, increase the effectiveness of the drug, as well as increase adverse effects, such as liver damage.

Against the idea of increased effectiveness is the concept of saturation: if the drug fills all the androgen receptors, then the receptors are saturated, and adding more of the drug will not increase the effects. However, any potential toxic effects would remain.

The clinical study showed modest muscle gains; admittedly, they are more impressive in the absence of resistance training.

If someone already trains for strength regularly and efficiently, and eats enough protein (1.2 to 1.8 g/kg), then I'm skeptical whether adding a SARM like Ostarine would make a difference to muscle growth (hypertrophy). But it might, especially at higher doses.

Much more remains to be learned about SARMS like Ostarine, whether higher doses work better, whether they could be used in diabetics for insulin resistance, whether the very elderly (say, over 80) can use them safely, and so on.

**PS: To see how and why to build muscle without drugs, read my book, [Muscle Up](#).**

**PPS: [Check out my Supplements Buying Guide for Men, which includes supplements that will help build muscle.](#)**