

There's Something Fishy About Weight Loss

Contributed by Dan Gwartney, MD
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There is something soothing about simplicity; knowing results follow a single easy step. People don't want to have to think too deeply or make too many choices; they want convenience. The office supply superstore Staples caters to this attitude, promising the epitome of ease by pressing a giant red "EASY" button in their commercials. Yet, most other aspects of life are complicated by the confusing variety of options. Unfortunately, when there are so many options, people suffer from a paralysis of choice. It is the same paradox identified by author Barry Schwartz in his aptly named book,

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The Paradox of Choice: Why More Is Less.

In some ways, weight loss has suffered from the paradox of choice as well. On any given day, there is a new report of why one diet works or the other doesn't. Fat-loss drugs and supplements are touted as miracles in ads and defamed as useless or even dangerous in editorials. Physicians and scientists offer convincing studies of effective diets and drugs, but it does not help that the experts so commonly contradict each other. If science truly wished to make a contribution to the American public, it would find one act that was powerful enough to make a difference in weight loss. Something simple that would drop the scale another couple pounds without any mental or physical effort. This is the allure of fat-loss drugs and supplements; a simple decision to pop a pill or take an injection daily greatly improving one's odds of achieving weight-loss success. However, the effective drugs and supplements have all been taken off the market due to safety concerns and the dubious promotion of the fat-blocker Alli, which is described as only working if you do, makes one wonder if excess fat is a divine punishment.² Have mortals been sentenced to carry thick layers of fat much like the hypocrites residing in the eighth circle of hell in Dante's Inferno? [People who did not practice what they preached were forced to spend all eternity walking about in golden cloaks that were lined with lead, never allowed to rest.]

Fortunately, the sins of the flesh are not permanently retained in the flesh, so it is possible to shed excess weight, but how? What is the simple choice that can result in dropping a couple extra pounds? Believe it or not, the answer discovered by an international group of researchers was not an exotic African plant or a colloidal mineral. Instead, the group, headed by Professor Thorsdottir of the University of Iceland, learned that simply adding fish to the diet was all it took to increase weight loss in men on a hypocaloric diet. The design of the study was very simple. The men were measured and randomly divided into four groups. All the subjects were placed on hypocaloric diets (diets that contained fewer calories than the person burns in 24 hours) that resulted in a 600-calorie daily deficit. The groups differed as to whether they were allowed to consume any fish products. The first group ate no fish products, the second ate three meals a week with a lean fish (3 X 150 grams of cod, roughly 5½ ounces per meal), the third group ate three meals a week with a fatty fish (3 X 150 grams of salmon) and the fourth received six fish oil capsules daily.

The researchers followed the men for eight weeks, recording weight loss and using lab tests to confirm compliance with the diet (if they were eating the fish or taking the capsules). As expected, all the men lost a significant amount of weight by following a hypocaloric diet. After all, the foundation of weight loss is always taking in fewer calories than one burns throughout the day. As a group, the men lost an average of 14 pounds in eight weeks. Clearly, these were motivated subjects, as many weight-loss studies fail to show any benefit, because many people fail to follow the guidelines.

Because it is human nature to struggle with undereating for weeks or months at a time, most of the truly effective weight-loss products that achieved commercial success induced weight loss by suppressing the appetite. Other products that have had more limited success in clinical studies block the absorption of food calories, such as the fat-blocking drug Alli. The truly impressive weight-loss aids are the ones that work in people who do follow a diet and promote long-term compliance. After all, a person wants the best results from his efforts and wants to stick with a diet rather than have his weight yo-yo up and down.

Even though all the groups in the study demonstrated weight-loss benefits from dieting, clear distinctions were noted among the groups. The control group, men not receiving fish or fish oil, lost a little over 11 pounds on average, an admirable amount. However, when fish or fish oil was included in the diet, weight loss increased by 2 to 3 pounds during the eight-week study. Not only was a greater amount of weight lost, the weight appeared to come from the abdominal region, as waist circumference (waistline) was reduced by an additional inch. Control dieters dropped just under 2 inches off their waist; the fish group increased that by another inch, losing nearly 3 inches in just eight weeks.

These results represent about the best that can be expected with drug-free dieting. A 600-calorie deficit/day diet would be expected to result in a weight loss of approximately 10 pounds in eight weeks. The control group did slightly better, losing 11 1/2 pounds. The fish groups all did much better, losing 4 to 5 pounds more than expected.

In trying to understand why the simple inclusion of fish into the diet made such a difference, the researchers looked at what the fish diets added and reviewed the existing literature. No previous study had looked specifically at the effect of including fish in a diet on weight loss, though some had looked at the effect of adding fish oil. In agreement with earlier studies, including fish oil in the diet appears to accelerate weight loss in man.⁴ Fish oil is high in n-3 (also called omega-3) fatty acids, specifically EPA and DHA. Omega-3 fatty acids appear to increase the creation of mitochondria in fat cells, which is where fats (specifically fatty acids) are burned to create cellular energy and body heat.⁵ Additionally, omega-3 fatty acids increase the rate of fat burning.^{4,6,7} Similar effects are seen when fat cells are stimulated by beta-adrenergic drugs (like the effect seen with ephedrine/caffeine or clenbuterol), suggesting that fish oil consumption may make the fat cell more sensitive to the effect of drugs that act through the same pathway as ephedrine/caffeine.⁸ Interestingly, omega-

3 fatty acids may also block the formation of new fat cells, which would be important for long-term weight management.⁹

Since the group eating salmon (a fatty fish) consumed the highest total amount of omega-3 fatty acids, one would expect they would have had the greatest degree of weight loss, if the omega-3 fatty acids were the only reason weight loss was accelerated. In fact, the salmon eaters had the greatest overall weight loss. However, the capsule group was very close and lost the exact same amount of fat, despite receiving only half as much fish oil. It is worth noting that the salmon eaters received their omega-3 fatty acids in three meals, whereas the capsule group was given a lower dose, consistently throughout the week. Therefore, when the salmon eaters consumed omega-3 fatty acids, the "dose" was much higher, leading to greater peak concentrations. However, when the researchers examined how much omega-3 fat was present in cell membranes, a marker of bioavailability, they found a greater omega-3 content in the cell membranes of the capsule consumers.³

Thus far, the study has shown that omega-3 fatty acids appear to increase weight loss, fat loss and abdominal fat when consumed in fish (salmon) or as capsules. This had already been reported. The next finding is the most remarkable of the study, in that the researchers discovered that the group eating a lean fish (cod), which contained only one-tenth as much omega-3 fatty acids as the salmon diet, also exhibited significantly greater weight loss than the control group, nearly as much as the salmon and fish oil capsule groups. Further, the cod group appeared to hold on to lean mass a little better than the salmon group, though the difference was not statistically significant.³

This study is the first to report the positive weight-loss effects of lean fish. In attempting to explain the finding, the researchers discussed the potential role of the amino acid taurine. Taurine is an ingredient in certain energy drinks, including Red Bull. Taurine has been reported to induce weight loss in humans when supplemented in moderate amounts (3 grams per day).¹⁰ A recent animal study has demonstrated that taurine supplementation prevented obesity, in part by raising energy expenditure.¹¹ The authors of the animal study speculated that taurine supplementation may lead to an increase in a co-activator called PCG-1a. PGC-1a has been shown to be a key regulator of energy metabolism, and its activation is an element of beta-adrenergic stimulated fat loss (ephedrine/caffeine-like drugs).¹²

As taurine is limited in the typical Western diet, and concentrated in fish, it is likely that this is a major contributor to the fat-loss effect seen in the lean fish group. Given that salmon is high in both omega-3 fatty acids and taurine, one would expect it to have a much greater effect than either cod or the fish oil capsules. However, this was not the case.¹³ It is likely that rather than having a synergistic effect of combining the fat loss benefits of two different pathways, omega-3 fatty acids and taurine present in combination in salmon appear to have no more than a slight additive effect, suggesting they might support the same fat-loss pathway.

It was also interesting to note that adding fish to the diet did not increase weight loss or fat loss in women. It is unclear why this is the case. However, as the subjects in this study were between the ages of 20 and 40, all the women would be premenopausal, and thus have relatively high estrogen concentrations. Estrogens increase the activity of a class of receptor in fat cells called the α -2 adrenergic receptor, which reduces the fat loss effect of beta-adrenergic stimulation.¹⁴ If omega-3 fatty acids and taurine act through the beta-adrenergic pathway to induce weight loss, it is understandable how this route would be less effective for women. Further, research published in 2002 demonstrated that women have a higher capacity for synthesizing DHA (one of the two main fatty acids in fish oil) from alpha-linolenic acid (an essential fatty acid present in the diet).^{15,16} Thus, women would have higher levels of DHA than men and benefit less from fish oil supplementation.

To have any take-home value, a study should be able to be summarized in a single sentence. For this well-designed study, the summary could be written as: "Adding three fish meals a week to the diet will increase weight loss significantly." A teaser sentence could be added stating, "Fish appears to increase fat loss by providing omega-3 fatty acids and taurine which increase beta-adrenergic signaling and beta-oxidation." Is there any further value to this study? It appears that much of the omega-3 fatty acid benefit can be obtained through capsules and it is possible that the same might be true for taurine. However, athletes should be aware that the diets were not optimal for maintaining lean mass, which accounted for approximately 40 percent of the weight lost.³ However, as the diets were relatively low in protein (20 percent by calorie or roughly 80 grams per day) and no exercise was included in the regimen, it is possible that increasing protein and adding resistance training could prevent the loss of skeletal muscle. Adding fish...how simple is that? A few fillets of salmon or cod, perhaps five cans of tuna in the grocery cart every week and your odds for weight loss success have improved significantly. Make the choice.

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