Mini-Fast with Exercise – My Personal Experience

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The concept of mini-fast with exercise assisted with carnitine/hydroxycitrate supplementation resulted from two independent lines of inquiry that ultimately converged.

Low-Fat Eating for Leanness

Back in 1984, I visited China and Japan in the course of attending an international scientific congress on dietary selenium. After I had been walking around in Tokyo for a couple of days, a thought suddenly struck me: "Where are the fat people?" I literally recall seeing only one Japanese I considered fat during my several days in Japan – and that was a fellow dressed in a business suit in the Narita airport who might just have arrived on a flight from the West. When I flew into Portland on my return trip, it seemed to me that just about every other person I saw at the airport was either overweight or outright obese. The contrast could not have been more stark.

This observation haunted me for several weeks after my return. Why were the Japanese so effortlessly lean? And I say effortlessly, because I never saw a jogger in my visit to Tokyo. Evidently, it had to be the traditional Japanese diet that was responsible. So I nosed around in the literature and learned that this traditional diet was extraordinarily low in fat calories – they constituted only about 10% of total calorie intake.

At about the same time, biomedical scientists were demonstrating that, in contrast to many animals such as rodents or cows, humans have a very limited capacity to convert dietary carbohydrate to fat. You can induce this capacity to a degree if you gorge yourself beyond your natural appetite for days on end, if you eat a diet extremely high in fructose, or you eat a diet that is literally devoid of fat. But for practical purposes, humans convert very little of their dietary carbohydrate to fat. In other words, the fat that you eat is the fat that you wear!

So I put two and two together to solve my conundrum about Japan – throughout their entire lives, the Japanese had been eating so little fat that they never had a chance to get fat! I soon published a paper entitled "The unique merits of a low-fat diet for weight control". This idea may seem obvious now, but, believe it or not, I think there was only one other paper in the formal literature at the time which made the same point.

But I realized that very-low-fat eating wouldn't necessarily induce substantial weight loss in people who were already fat – unless they simultaneously enhanced their burning of fat with effective fat-burning exercise. So I proposed that the key was to combine low-fat eating with appropriate aerobic training. And this accorded well with the experience of the Pritikin Clinics, which were then using very-low-fat whole food diets and daily walking exercise to treat heart patients – not only did heart problems and risk factors improve rapidly, but over the first few months overweight patients progressively lost weight, without counting calories. And Dr. Whitaker was one of the medical directors of the Pritikin Center at that time!

(Let me pause for a moment to vent on a pet peeve – the claim that "low-fat diets" aren't very effective for weight control. This claim is primarily based on studies in which "low-fat" is defined as 25-30% fat calories – considered a "practical intake" – rather than the 10-15% recommended by Pritikin or practiced by the Japanese. And these studies did not incorporate an exercise component – a *truly* low-fat diet *combined with exercise* is the key. The Pritikin approach demonstrably works, and works well – just look what has happened to President Clinton after he visited Pritikin's disciple Dr. Ornish: he's down to his high school weight again! Of course, the problem with it is that a lot of people are averse to adopting a very-low-fat quasi-vegan diet. Yet vegan diets, whether or not they are low in fat, are inherently beneficial for weight control because they have a low ratio of saturated to unsaturated fat that benefits the insulin sensitivity of muscle fibers. This leads to a compensatory decrease in day-long insulin secretion, which makes it easier for fat to leave your fat cells and be burned for energy. Very-low-fat diets such as those recommended by Pritikin tend to be quasi-vegan, and I think that that, beyond just the fact that they are low in fat, is one of the key reasons they work well for promoting leanness.)

Optimizing Fat Burning – The Mini-Fast with Exercise Protocol

This led me to my next problem – how should exercise be performed to maximize its impact on body fat? It seemed obvious to me that if you exercise not long after you've consumed a carb-rich meal, your exercise will do a wonderful job of burning the carbs you just ingested – as opposed to your stored fat! In other words, exercising during fasting metabolism, when fat cells are releasing their fat to help fuel your body, should do the most effective job of burning off the stored fat. I found a recent study consistent with this rather obvious deduction. Moreover, this study showed that, the longer one exercises (at moderate intensity) during fasting metabolism, the greater the contribution that fat burning makes to your fuel use. So prolonged moderate-intensity exercise in fasting metabolism should work great for lowering your body fat as long as you don't blow your benefits by following up with fatty meals that replace the fat you've just burned off!

The research literature also indicated that selective use of fat for fuel tended to persist in the hours after fasting exercise if no food was ingested during this time. Plus I noticed that after significant sweaty aerobic exercise, I experienced little hunger for at least an hour afterwards. So this led me to recommend that fasting aerobic exercise be followed by several more hours of fasting, to maximize the overall impact on fat loss. This was the basis of a paper I published in 1994 entitled "Optimizing exercise for fat loss", in which I recommended a regimen of morning fasting aerobic exercise, as prolonged as feasible, followed by a fast of several hours, before finally eating at lunchtime.

At about this time, I was fortunate to meet a bright and ambitious young Iranian-Austrian physician named Babak Bahadori, who was attending an obesity conference in San Diego. I explained my morning mini-fast with exercise strategy to him, and he was fascinated. On his return to Austria, he started coaching his overweight patients to try this. When he found that many of his patients had logistical difficulties with morning exercise (having to get the kids off to school and then having to be at work by 8, for example), or simply claimed they weren't "morning people", he generalized the program so that people could do their exercise at noon or in the evening – but in each instance nesting their exercise in a fasting period of 12-14 hours duration. For example, the "Ramadan" variant of this program was to eat breakfast and dinner – whereas "lunch" consisted in feeding off your stored fat while exercising at noon! Babak had occasion to explain this strategy to the fat Iranian ambassador to Austria. Several months

later, the grateful ambassador was lean! Babak went on to develop a "7 Step Program" for leanness which had as its centerpiece this generalized mini-fast with exercise regimen; it has become the most successful diet program in Austria. Babak has published an outstanding book about it, and also appeared on the Austrian equivalent of Oprah. The gorgeous lady who is photographed doing exercises in this book, Iris, had literally lost half of her initial weight by following Babak's program! What a contrast to the plethora of dubious diet books and ads which feature photos of models who have never been fat a day in their lives.

I have always preferred the morning version of mini-fast with exercise – the one that the Whitaker Wellness Institute is now recommending – because your evening of sleep is an effortless enforced fast, such that when you wake up your free fatty acid levels (the form of fat released by fat cells) are as high as they will be all day, ripe for burning! Plus when I wake up I feel energized and ready for "boot camp", whereas when I get home after a day's work, my urge is to drink good beer and veg out in front of the TV! But if there are reasons why morning exercise isn't practical for you, Dr. Bahadori's variants may be a good alternative.

By the way, I'm sure that this morning fast with exercise idea has occurred independently to a lot of smart people. Numerous know-it-alls have written articles maintaining that eating breakfast is vital for weight control. I saw a letter written in response to one of these articles by a scientist who stated that he never ate breakfast, that he did aerobic exercise in the morning, and that he had been quite lean for years. It is claimed that a high proportion of fat people don't eat breakfast. While this may be true, you can bet that these people aren't spending their mornings on a treadmill or taking a prolonged brisk walk. And I'll also bet that many of them grab a doughnut when they get to the office!

Unlocking the Liver's Capacity to Burn Fat

As I noted, there's another key part to my story. Early in my career, the company I worked for developed a safe version of the protein-sparing fast, and I was curious as to why prolonged fasting causes a loss of hunger. A similar phenomenon is seen in people who have been on a low-carb ketogenic diet for several days. This loss of hunger appears to be rooted in a metabolic adaptation by the liver which makes it much more proficient at burning fat. I learned that rapid burning of fat in the liver induces a satiety signal that is transmitted to the brain via the vagus nerve. Also, this fat burning is only partial, generating ketone bodies that enter the circulation and can provide vital fuel for the brain and other tissues. (The brain can't directly burn fat for fuel.) And liver fat burning also generates the energy that enable the liver to convert protein or lactic acid to glucose – as process called "gluconeogenesis". This newly synthesized glucose can prevent blood sugar levels from dropping too low during a fast.

The nutrient carnitine plays a catalytic role that enables fatty acids to be taken up into mitochondria, the "power plants" of our cells, where they can be burned to generate usable energy (ATP). Back around 1980, I encountered a newly published Japanese clinical study in which 4 medical students were put a total fast for several days. Two of these students were given an intravenous infusion of carnitine early on the first day, the other two were not. What was remarkable is that blood sugar levels after the first day had plunged to about 50 by the morning of the second day in the students who hadn't gotten the carnitine, whereas it was about 80 in both of those who had gotten the carnitine. The authors suggested that this reflected the ability of carnitine to boost gluconeogenesis, thereby keeping blood glucose at a reasonable level. It occurred to me that the students with the blood sugar of 80 were probably feeling considerably

more spunky that those with a level of 50! Over several days, the blood sugar gradually rose toward 80 in the students who didn't get the carnitine, so the benefit of supplemental carnitine in this regard appeared to be only temporary.

If I had been a hard-nosed scientist, I might have dismissed this study out of hand because it involved only four subjects. But I like to use my common sense and play my hunches. So I tried this idea out on myself. I had never consciously tried to fast before – I've always been fairly lean – so this was a bit of an adventure for me. At night I took some carnitine –I frankly can't remember how much – and in the morning I took more. I didn't eat for the subsequent day, and I was a bit surprised at how normal I felt. Then I tried this idea out on a friend who was a veteran faster. She reported to me that she'd never had an easier fast in her life! This convinced me that I should look into this issue further in the physiology literature.

At the time, a scientist named Dr. Denis McGarry was doing ground-breaking research that helped to explain how the liver developed the capacity to burn fat avidly during a fast. He found that the liver's level of carnitine is fairly low in rats that are eating regularly, but that it increases substantially during the first several days of a fast; this increase coincides with an increase in the liver's capacity to make ketone bodies and new glucose. This increase results from a migration of carnitine from skeletal muscle – where its level is high – to the liver. This appears to result from the fact that the decrease in insulin and the concurrent increase in the hormone glucagon that occurs quickly during fasting greatly increases the liver's capacity to take up carnitine. And the increase in carnitine appeared to be crucial to the adaptation to fasting. When McGarry removed the livers of rat and perfused them with carnitine, this greatly amplified the ability of these livers to produce ketone bodies when the livers were subsequently perfused with free fatty acids.

Promoting carnitine accumulation is not the only way that prolonged fasting activates liver fat burning. When the liver is high in stored glucose (glycogen), some of this glucose is converted to a compound known as malonyl-coA. This compound inhibits the enzyme – carnitine palmitoyltransferase – that works with carnitine to transport fats into mitochondria for burning. During the first couple of days of a fast, liver glycogen stores are greatly depleted, leading to a reduction in malonyl-coA levels that enables carnitine to work more effectively as a fat burner. I'll return to this theme in a moment. Insulin activity also works to inhibit this key enzyme, whereas glucagon tends to activate it.

These considerations led me to publish a paper in which I suggested that supplemental carnitine, administered in ample doses for the first couple of days of a fast, might accelerate the liver's adaptation to fasting, thereby making fasting easier to tolerate. It's widely known that the first couple of days of a fast or a ketogenic low-carb diet are the hardest to get through. I published this idea 25 years ago, but as far as I know it has never been given a formal scientific test. In fact, with the exception of my physical trainer friend John Gustin, no one had shown any interest in this idea until I explained it to Dr. Whitaker a while ago!

While it is nice to have a worthwhile adjuvant to fasting regimens, it would be nicer to have a strategy that could activate liver fat burning in people who weren't embarking on significant fasts. Arguably, such a strategy could help to burn off some fat while aiding appetite control. But I realized that as long as there was still a lot of glycogen in the liver, production of malonyl-coA in the liver would limit the

potential of supplemental carnitine to activate fat burning. And, at the time, I didn't know of any way to block the production of malonyl-coA. That's where the matter rested for over a decade.

Then one day a friend of mine told me about the newest diet craze, a compound called hydroxycitrate that was derived from the rind of a fruit traditionally eaten in India known as garcinia (also called brindall berry). Scientists at Hoffman-Laroche had been very interested in this compound because they found that it could block an enzyme required to make malonyl-coA. And malonyl-coA is the biosynthetic precursor for fat synthesis. When rats were fed sugar-rich diets that ordinarily would make them fat by driving liver fat synthesis, coadministration of hydroxycitrate (HCA) tended to prevent their obesity! Hoffman-Laroche eventually lost interest in this project because HCA is a natural compound that can't be patented, and hence couldn't be turned into a drug. But, cleverly, the Sabinsa Corporation had just developed a new nutraceutical ingredient by extracting HCA from garcinia; they were promoting it by claiming it would inhibit fat synthesis.

Unfortunately, my memory is not always as sharp as I would like it to be, and when my friend told me about this HCA product, I was initially dismissive. I told him that it might work great in rodents, but that it was unlikely to work in humans, because humans make very little fat.

But "malonyl-coA" rang a little bell in my head. I vaguely remembered I had encountered that before. By the next day, it suddenly dawned on me: HCA was the compound I had needed a decade ago to make carnitine work better as an activator of liver fat burning! The utility of HCA in humans would have little or nothing to do with blocking fat synthesis, it would have everything to do with activating fat burning! I quickly published a paper which set forth this idea, and within a few months my little nutraceutical company NutriGuard had a new product called Brindall Trim that combined carnitine and HCA.

Putting it All Together

Now here's where my two stories begin to converge. I had a friend, known as J.R., who was quite overweight. I gave him a bottle of the new Brindall Trim to see if it might help him. After a couple of weeks, I heard back from J.R., and he told me something remarkable. "Mark, this weekend my family went to the lake for a picnic, and I spent a lot of time swimming. And after a while it suddenly occurred to me – I had been in the water for about 3 hours, and I wasn't tired!"

This anecdote started me thinking – could HCA/carnitine supplementation improve exercise endurance? I studied the issue in the literature, and found that an adaptive increases in gluconeogenesis – fueled by increased liver fat burning – helps to buffer the decrease in blood glucose that results as liver glycogen stores are gradually exhausted. And it is this decrease in blood sugar causes people to "crash" after they have exercised too long. So it occurred to me that boosting the liver's fat burning potential with HCA/carnitine taken before fasting exercise might postpone "hitting the wall" in exercisers, and perhaps make less draconian exercise a little easier to take. I published this idea too, and it likewise has never been formally studied, although some rodent studies from South Korea conclude that HCA alone can somewhat improve exercise endurance in rats.

(Potentially, if it were possible to increase HCA levels in muscle fibers sufficiently, HCA might also promote selective fat burning in muscle during exercise, thus aiding endurance by sparing muscle glycogen stores. But HCA is not taken up very efficiently by cells, and I suspect that it would require

high doses of HCA taken over many days to evoke this effect to a meaningful degree. So the acute effects of HCA are probably mediated by the liver, which has privileged access to HCA after oral administration.)

Fortuitously, the development of Brindall Trim coincided with my formulation of the mini-fast with exercise strategy. So I began to try this strategy on myself, taking a full dose of Brindall Trim before and soon after each exercise session. Initially, I would do about an hour of exercise on a stair climber at the gym. But one day it occurred to me that I wasn't any more tired after an hour than I had been after twenty minutes, so I pushed the duration, sometimes exercising for two hours or more. I also found that, by continuing to take Brindall Trim following the exercise, my hunger was in such good control that I sometimes would skip lunch too! You can imagine what the impact on fat burning would be if you exercised for about two hours in the morning and then ate nothing until dinnertime – when you carbo loaded to prepare for the next morning's exercise.

As I say, I have never been fat. Before I had embarked on this program, John Gustin had measured my body fat at about 15%. By the time I equilibrated, I was down to 5%. Which is to say that I had blown off two-thirds of my initial body fat!

After I had gotten that lean, I found that I was less inclined to do two hour exercise sessions, and that skipping lunch in addition to breakfast wasn't as easy either. So I just settled into a pattern of exercising for about an hour, usually 4 times a week, and just skipping breakfast. I have maintained my leanness over the intervening 15 or so years – I am now 60 – and the fact that I became a vegan in the interim probably hasn't hurt.

Turbocharging the Regimen with Pyruvate or Glycine

There is one more interesting facet to this story. A couple of years or so after the development of Brindall Trim, my friend John Gustin, who was using the mini-fast with exercise strategy plus Brindall Trim with his overweight clients, told me that he had been commissioned to design a new weight loss supplement by a wealthy businessman who wanted to become a nutraceutical entrepreneur (like half of the rest of humanity!) He had an idea that the natural metabolite pyruvate, recently introduced as a nutraceutical ingredient, might be good complement to Brindall Trim. In relatively high doses, dietary pyruvate had been shown by researchers at the University of Pittsburgh to inhibit fat gain in rats, an effect that was associated with an increase in thermogenesis (direct conversion of calories to heat and CO2) likely centered in the liver. Dr. Stanko in Pittsburgh had also published studies showing that, in very high daily doses, pyruvate supplements help to prevent weight regain in people who had recently lost weight. The multi-level entrepreneurs who had introduced pyruvate supplements to the American market were recommending doses far too low to be of likely benefit, but John proposed doing a study in which a supplement amalgamating the compounds in Brindall Trim with a reasonably ample dose of pyruvate was used in conjunction with a mini-fast with exercise regimen and food choices quite low in fat and high in protein. (Protein boosts glucagon production.) I had been acquainted with the Stanko research, so I told John that I thought that this would be a fine idea – perhaps the pyruvate would interact favorably with the HCA and carnitine. The wife of the entrepreneur was Samoan, and John managed to recruit a number of volunteers for the study, most of whom were quite heavy.

The results of the study were rather mind-blowing – to the extent that they probably wouldn't have been believed if anyone had bothered to read them. Most subjects participated for 3-4 weeks; their fat loss (assessed by the Futrex infrared technique) averaged around 5 pounds per week – this in people who weren't counting calories or doing draconian exercise. One gentlemen of over 400 pounds appears to have lost 50 pounds of fat in 24 days – while complaining that he felt so warm at nights that he had to use a fan to get to sleep! These results can only be explained by induced thermogenesis – which is something that rats can do rather efficiently when overfed, but which is far less significant in humans – very likely induced in the liver. John and I then published a paper in which I offered an attempt at an explanation of the thermogenesis; we published a summary of John's open clinical study in an appendix to the paper.

Although I didn't have any direct contact with the subjects in this study, and can't vouch for the absolute accuracy of John's Futrex measurments, I subsequently observed in several overweight friends of mine, using Brindall Trim and pyruvate in conjunction with mini-fast with exercise, that anomalously high rates of fat and weight loss could be achieved in the first month, strongly suggestive of a thermogenic effect. However, it became evident that the thermogenic impact tended to be lost after a month or so, possibly owing to some adaptation of the liver. Nonetheless, people would maintain their weight loss if they stuck with their exercise. John and I tried vainly for a number of years to get a more formal study of this strategy, that hopefully would confirm the remarkable thermogenic effect he had observed – which was reasonably credible in light of the thermogenic effect Stanko had documented in rats. But nothing came of our efforts. One of the problems is that pyruvate is a bit unstable and could cause GI upset. Dr. Michael Colgan, a noted exercise physiologist, tried this program on himself and wrote glowingly about it, claiming that a thermogenic effect was most evident in his case. But he judged that poor tolerance for pyruvate would prevent this approach from becoming popular.

About five years ago, I became aware of the fact that the amino acid glycine – which has a pleasant sweet flavor, which is well tolerated and inexpensive, and coincidentally is reported to cause a marked boost of glucagon secretion when administered orally – is converted quite efficiently to pyruvate in the liver – albeit it takes two molecules of glycine to generate one molecule of pyruvate. I therefore wrote up a paper – I haven't gotten around to publishing it – in which I proposed that high intakes of glycine might be an excellent adjuvant with HCA/carnitine, possibly promoting the thermogenic effect we had observed with direct pyruvate supplementation. I sent the manuscript to a friend of mine who knew Dr. Stanko, and he informed me that, in unpublished research, Stanko had found that, if administered in about twice the dose, glycine produced the same thermogenic weight control effect in rats that he saw with pyruvate!

Although my glycine idea hasn't been published, it has captured the imagination of Dr. Whitaker, who suggested that we consider developing a product featuring glycine/HCA/carnitine that could be used in conjunction with mini-fast with exericise, or as an adjuvant to more prolonged fasting regimens.

It is personally very satisfying to me that, just within the last several years, open studies of the mini-fast with exercise regimen, first at Oasis of Hope Hospital, and then at the Whitaker Wellness Institute, have confirmed that the mini-fast with exercise strategy can help many people to get quite significantly leaner in a relatively short period of time, without calorie counting. Importantly, unlike calorie counting, this is a regimen that can feasibly be adopted as a healthful, sustainable lifestyle.

A comment by a gentlemen who participated in the Whitaker Wellness Institute study of this strategy was particularly pleasing to me. He noted that, during the study, he was eating the same types of food he had

eaten previously, and that he wasn't exercising much more than he had done previously. But now he weighed twenty pounds less, and he planned to continue this program indefinitely.

Which brings us to a key point. So-called experts will prate endlessly about the importance of exercise; yet they rarely will provide any guidance with respect to the context of that exercise. There are many people who complain that they exercise regularly, but they have never seen any weight loss at all. I would bet that a lot of people who have this problem have a carb-rich breakfast and then go exercise – which will succeed in burning the carbs they just ingested, rather than their stored fat. The metabolic context of exercise matters!

One final comment on that point. Scientists in Norway are now demonstrating that exercising in fasting metabolism has a more favorable effect on muscle insulin sensitivity than exercise done after eating. That's because fasting exercise helps to burn off fat stores that have accumulated in muscle fibers. Fat that accumulates in muscle fibers in excess of metabolic need – its known as "ectopic fat"- can give rise to metabolites that impair the efficiency of insulin signaling in muscle. So getting rid of that ectopic fat with fasting exercise can have an acute favorable impact on insulin sensitivity – complementary to the long-term impact of exercise that promotes insulin sensitivity by inducing or preserving leanness. It appears that episodic fasting and regular fasting exercise has a great deal to contribute to health and appearance!