The Primal Blueprint Podcast – Episode #28: A Case Against Cardio Essay, Part 1

Brad: Welcome back to the Malibu studios. I am your host, Brad Kearns here with Mark Sisson and, Mark, we had a smattering of differing types of podcast guests in recent weeks, and now were back at ground central with Mark

Mark: It's great to be here. I think we've had some awesome input from the guests, and now its time to get back to 'what do I really think?'

Brad: So, we were thinking about how to keep it fresh and interesting with the listeners, and were gonna try something a little different today. So, what we thought what would be interesting for you to read one of your most popular and influential posts, the famous The Case Against Cardio….So, you've posted on this topic several times, dating back to, when was the first one published?

Mark: 2007. I can't believe it.

Brad: So for 7 years you've been speaking the truth to these poor endurance athletes who think they're actually being healthy *and* fit, and trying to draw a distinction there. So what we have here is a nice essay that gets back to that original post, but also threading in some comments from some of the follow up posts. So here's mark reading Case Against Cardio,a from June 2007.

MARK READ:
Unfortunately, **the popular wisdom of the past 40 years – that we would all be better off doing 45 minutes to an hour a day of intense aerobic activity – has created a generation of over-trained, under-fit, immune-compromised exerholics.** Hate to say it, but we weren't meant to aerobicize at the chronic and sustained high intensities that so many people choose to do these days. The results are almost always unimpressive. Ever wonder why years of "Spin" classes, endless treadmill sessions and interminable hours on the "elliptical" have done nothing much to shed those extra pounds and really tone the butt?

Don't worry. There's a reason why the current methods fail, and when you understand why, you'll see that there's an easier, more effective – and fun – way to burn fat, build or preserve lean muscle and maintain optimal health. The information is all there in the primal DNA blueprint, but in order to get the most from your exercise experience, first you need to understand the way we evolved and then build your exercise program around that blueprint.

Like most people, I used to think that rigorous aerobic activity was one of the main keys to staying healthy – and that the more mileage you could accumulate (at the highest intensity), the better. During my

20+ years as a competitive endurance athlete, I logged tens of thousands of training miles running and on the bike with the assumption that, in addition to becoming fit enough to race successfully at a national class level, I was also doing my cardiovascular system and the rest of my body a big healthy favor.

Being the type A that I am, I read Ken Cooper's seminal 1968 book *Aerobics* and celebrated the idea that you got to award yourself "points" for time spent at a high heart rate. The more points, the healthier your cardiovascular system would become. Based on that notion, I should have been one of the healthiest people on the planet.

Unfortunately, I wasn't – and that same mindset has kept millions of other health-conscious, nirvana-seeking exercisers stuck in a similar rut for almost 40 years. It's time to get your head out of the sand and take advantage of your true DNA destiny, folks!

The first signal I had that something was wrong was when I developed debilitating osteoarthritis in my ankles…at age 28. This was soon coupled with chronic hip tendonitis and nagging recurrent upper respiratory tract infections. In retrospect, it is clear now that my carbohydrate-fueled high-intensity aerobic lifestyle was promoting a dangerous level of continuous systemic inflammation, was severely suppressing other parts of my immune system and the increased oxidative damage was generally tearing apart my precious muscle and joint tissue.

The stress of high intensity training was also leaving me soaking in my own internal cortisol (stress hormone) bath. It wasn't so clear to me at the time exactly what was happening – in fact it was quite confusing, since I was doing so much of this so-called "healthy" aerobic exercise – but I had no choice but to give up racing, unable to train at anywhere near the intensity required to stay at an elite level.

To make ends meet…

…I became a "personal trainer" and I refocused my attention on training average "non-athletic" people to achieve reasonable levels of general fitness and health. Of course, we lifted weights as part of the overall plan (and I will go into greater detail on that important aspect of fitness in a later post), but for the aerobic component of their training, I started doing long walks or hikes or easy bike rides with them. My many clients got the benefit of me actually working out right along side them and I got the benefit of 3 to 5 hours a day of very low intensity aerobic work (well, very low for me anyway). It was refreshing and really didn't take much effort on my part, but I knew I had to be deriving at least some small benefit from those hours.

Since I didn't have much time left in the week for my own workouts, once or twice a week I would do a very short but very intense workout for my own benefit, usually sprints at the track or "hill repeats" of 2-3 minutes each on the bike. Lo and behold, within a year, my injuries were healing, I was rarely sick and I was even back to occasionally racing – faster than ever. Something "primal" was happening and it made total sense in the context of the DNA blueprint. I was training like my hunter-gatherer ancestors, building

my aerobic capacity slowly and steadily without overstressing my adrenals or my immune system, training my body to derive more energy from fats (and not glucose), requiring far fewer carbohydrate calories from my diet, and building muscle with occasional quick bursts of speed and intensity. I was suddenly both fit AND healthy. My Primal Health system was kicking in and it all made perfect sense.

Humans, like all mammals, evolved two primary energy systems that powered the skeletal muscles of our hunter-gatherer ancestors 40,000 years ago and that would keep us all well-powered the same way today, if we weren't so bent on circumventing them with our ill-fated (literally) lifestyle choices.

The first energy system relied heavily on the slow burning of fats to create ATP (the universal energy currency), keeping us fueled while we were at rest or sleeping, yet also allowing for continuous or intermittent low levels of aerobic activity (think of our ancestors walking across the savannah for hours foraging for roots, shoots, berries, grubs, insects and the occasional small animal). It makes sense. Fats are very efficient fuels that are stored easily in the fat cells and burn easily and cleanly when lots of oxygen is present (as when we are breathing normally). Even if there's no food in the immediate area, a well-trained fat-burning hunter-gatherer could continue walking and foraging for days without compromising his or her health or efficiency.

The second major energy system we developed through evolution was the ATP-PC system, which allowed for intense loads of work to be done in very brief bursts (think of our hunter-gatherer ancestors sprinting to the safety of a tree to avoid being eaten by a lion). Both ATP and phosphocreatine (PC) are always sitting right there within the muscle cells, with the former providing a quick burst of energy and the latter replenishing the former as it depletes. Together, they are the highest octane fuel we have, but it doesn't last long. In fact, it's ATP-PC and adrenaline that allow the little old lady to lift the front end of the Ford Fairlane off her husband when the jack fails. Unfortunately, the muscles can only store about 10-20 seconds worth of this precious fuel to complete life-or-death tasks. If our ancestors survived that quick sprint to safety, however, their ATP and PC reserves were filled again within a minute or two, making available another 10-20 second slot of intensity.

Furthermore, that brief burst of intense energy sparked a small "growth spurt" in the muscle, making it even stronger for the next encounter with the next lion – a true survival adaptation.

(Note: While our energy systems are actually quite complex, varied and interrelated, I have simplified things here to make it easier to "digest".)

Bottom line: Fats and ATP-PC were the two primary energy sources for locomotion: we either moved slowly and steadily or "fight or flight" fast, and we became stronger and healthier the more we used only those energy systems.

But here's the real take-home message for us: We did not evolve to rely heavily on a carbohydrate-fueled energy system, and yet, carbohydrate metabolism seems to rule our lives today. Yes, carbohydrate (in the form of glucose) can play a major role in the production of energy in skeletal muscle, but it turns out that the heart and skeletal muscle prefer fatty acids (fat) as fuel over glucose.

Our hunter-gatherer ancestors didn't regularly ramp their heart rates up for over an hour a day like so many of us do now. Even when the concept of organized hunting came along, it would appear that our hunter-gatherer ancestors relied more on superior tracking ability (using our highly evolved and exceptionally large brains) and walking (using our superior fat-burning systems), rather than on actually "chasing down" their prey. In fact, squandering valuable energy reserves (and increasing carbohydrate [glucose] metabolism by a factor of ten) by running hard for long periods of time was so counterproductive it would have likely hastened your demise (imagine chasing some game animal for a few hours and – oops – not succeeding in killing it. You've spent an incredible amount of energy, yet now you have no food to replace that energy. You have suddenly become some other animals prey because you are physically exhausted).

So, what does all that mean for us in the 21st century seeking to maximize our health and fitness?

Well, we know that this current popular high intensity aerobic pursuit is a dead-end. It requires huge amounts carbohydrate (sugar) to sustain, it promotes hyperinsulinemia (overproduction of insulin), increases oxidative damage (the production of free radicals) by a factor of 10 or 20 times normal, and generates high levels of the stress hormone cortisol in many people, leaving them susceptible to infection, injury, loss of bone density and depletion of lean muscle tissue – while encouraging their bodies to deposit fat. Far from that healthy pursuit we all assumed it was! What, then, is the answer?

Knowing what we know about our hunter-gatherer ancestors and the DNA blueprint, we would ideally devise an aerobics plan that would have us walking or hiking several hours a day to maximize our true fat-burning systems and then doing intermittent "life or death" sprints every few days to generate those growth spurts that create stronger, leaner muscle.

However, since allocating a few hours a day to this pursuit is impractical for most people, we can still create a plan that has a fair amount of low level aerobic movement, such as walking briskly, hiking, cycling at a moderate pace, etc., a few times a week and keep it at under an hour. Then, we can add a few intense "interval" sessions, where we literally sprint (or cycle or do anything intensely) for 20, 30 or 40 seconds at a time all out, and do this once or twice a week.

If you are willing to try this new approach, but haven't sprinted for a while, you may want to ease into it. Start with maybe three or four the first time, resting two minutes in between and, after a few weeks of doing this, work your way up to a workout that includes six or eight all-out sprints after a brief warm-up. An easy few minutes of stretching afterwards and you've done more in less time than you could ever

accomplish in a typical "80-85% Max Heart Rate" cardio" workout. That's exactly type of the plan I do myself and that I recommend to all my readers and live lecture participants now.

Let's recap:

The benefits of low level aerobic work (walking, hiking, cycling, swimming):
- increases capillary network (blood vessels that supply the muscle cells with fuel and oxygen)
- increases muscle mitochondria
- increases production of fat-burning and fat-transporting enzymes
- more fun, because you can talk with a partner while doing it

The benefits of interval training (sprinting in short intense bursts)
- increases muscle fiber strength
- increases aerobic capacity (work ability)
- increases muscle mitochondria (the main energy production center in muscle)
- increases insulin sensitivity
- increases natural growth hormone production

The costs of chronic (repetitious) mid- and high-level aerobic work
- requires large amounts of dietary carbohydrates (SUGAR)
- decreases efficient fat metabolism
- increases stress hormone cortisol
- increases systemic inflammation
- increases oxidative damage (free radical production)
- boring!

Now here's the follow up post, "*The Evidence Continues to Mount Against Chronic Cardio"*

Despite my attempts to clarify the dangers associated with Chronic cardio and chronic exercise in general over the past few years, I still receive a lot of questions and comments about cardio. People just have a tough time divorcing themselves from the notion that cardio – as much as you can cram into your schedule – is the key to health and fitness. I don't blame them, really. It's conventional wisdom, after all, and it's what I thought for years and years. Clearly, another post is needed. Evidence against chronic cardio continues to mount, so there's a lot to cover. But before we get to all the research, I have a few thoughts about the heart.

Here's the thing about the heart: being an involuntary muscle, it has no say in the matter. It pretty much feels nothing, too. It's along for the ride. Just like the liver, kidneys, pancreas, thyroid, adrenals, etc., the heart responds to biochemical signals. It's a demand organ. Minor changes in blood chemistry (epinephrine, cortisol, insulin, lactic acid, hemoglobin-depleted RBC's, to name a few) cause it to respond

by beating faster or slower, forcefully or not, to keep pace with the muscles' (and other organs') demand for oxygen and fuel.

During exercise, it's the brain that starts this whole process with a (usually) conscious decision: "I think I'll run to that tree." That thought prompts the muscles of the legs to start moving faster and the arms to pump. The new, increased demand for oxygen and added fuel (over and above normal resting metabolism) signals the heart to start to fulfill the demand, to pump harder and faster. It's obliged to do so. Period. No choice. That's also why it's always a bit behind schedule: it takes more than a few seconds to ramp itself up once the action begins and a few seconds or minutes (or hours, in the case of an over-trainer) to ramp down, once it's over.

The problem with chronic cardio is that we can force our brains to override some of the tiredness (no pain, no gain, pal) and discomfort in the legs – and to a certain extent even the lungs – and keep doing these hard endurance workouts incessantly day in and day out. The ostensible limiting factor is the ability to burn fat or, at the very least, the amount of glycogen still left in our muscles. That's what eventually brings us to a halt, frequently because we have willed ourselves to keep going through the wall at all costs.

But the heart is often over-worked in this scenario, just trying to keep up with that "inhuman" (and inhumane) desire to run, cycle, or swim further and faster in pursuit of…what? A medal? A ribbon? Bragging rights? It can't say no. It attempts to do as we bid it. And because the heart feels little-to-no pain – unless, perhaps, it feels the REAL pain of a heart attack – it very often suffers silently as a result without us ever knowing. The walls of the heart start to hypertrophy over time the same way a biceps muscle does when you do curls. But do a few too many curls and your biceps will get sore quickly. Force yourself to do a few more and you could even tear something and be out of contention for a few weeks. We know when to stop before that bicep tears.

Cardiac muscle doesn't tear that way when over-worked, but it does enlarge and thicken with chronic overuse. In some – most – people the thickening is probably not life-threatening, but in some cases, as with dozens of world class athletes I have personally known, this thickening can cause all manner of issues later in life. Atrial fibrillation has become a mild epidemic in my generation of life-long aerobicizers; several of my friends have had pacemakers or defibrillators implanted before the age of 40 to head-off those sporadic life-threatening cardiac enervation problems. A few more friends have lost significant cardiac function and a few have died.

But don't take my word for it. The silent epidemic of heart issues among endurance athletes is getting serious attention in the research community. Let's take a look at some of the latest research.

Cardiac Arrhythmias

Cardiac arrhythmias are abnormal electric activities of the heart. An arrhythmia can describe a heart that beats too fast, too slowly, too irregularly, or too "fluttery." An arrhythmia doesn't always indicate or foretell heart trouble, but it's a common risk factor. One of the more common varieties is atrial fibrillation (AF), which describes a fast, irregular heartbeat. AF is strongly linked to stroke and cognitive decline.

Endurance athletes are at a greater risk for atrial fibrillations than the general, non-running public. One recent study of cross country skiers even found that the best athletes, the top performers, were more likely to have cardiac arrhythmias than the rest. Moderate exercisers, meanwhile, are at a lower risk for AF than the general, non-running public. A recent comprehensive study offers several potential explanations for the increased risk:

- Increased fibrosis (scar tissue formation) in the heart.
- Myocardial injury to the heart, as evidenced by post-training elevated cardiac biomarkers typically used to diagnose injury. Probably not a big deal so long as you recover fully from your training, but most cardio junkies can't wait that long to log more miles.
- Excessive amounts of inflammatory markers brought on by training. These markers have been linked to AF. Endurance-related AF usually starts off infrequent. The older you get and the more miles you log, the more entrenched and regular your atrial fibrillation may get. Some studies found that around 40% of athletes with AF eventually progress to persistent AF, where it's happening on a regular basis. That's the troubling kind of AF that may presage serious cardiovascular problems, like stroke.

Atherosclerosis

It's totally counterintuitive to think that endurance athletes are at risk for arterial plaque. "You mean to tell me that the wispy greybeard whizzing past my house in short shorts every evening could have clogged arteries? No way." Maybe, just maybe.

A 2011 study found evidence of carotid and peripheral atherosclerosis in a group of marathoners. Although there was no control group of non-runners in that study, another study compared the arteries of marathon runners to a control group of sedentary non-marathoners. Marathoners had more calcified plaque in their coronary arteries, which has been linked to stroke and dementia. The tricky thing about these cases is that endurance athletes with atherosclerosis don't evince the regular signs. Whereas your typical sedentary guy with extensive atherosclerosis will probably have all the hallmarks (metabolic syndrome, abdominal obesity, hypertension, etc.), marathon runners with atherosclerosis don't fit the traditional cardiovascular risk profile.

It might be time to add "trains for endurance athletics" to the list of risk factors.

Oxidative Stress/Overtraining

It's no secret that endurance training induces oxidative stress on the athlete. That's how we get better – by encountering a stressor, being broken down a bit, and then recovering stronger than before so that the next time we encounter the stressor, we'll be better than the last time. Whether we're talking strength training, marathon running, cycling, gymnastics, martial arts, or even studying for a trigonometry class, we have to challenge our physiology to get better, and challenges to the physiology mean oxidative stress. Problems arise when we don't let up, when we keep the intensity elevated and the days off few and far between. We're constantly in that post-workout state, and it starts to look like *chronic* oxidative stress for all intents and purposes. Even if our times are improving, we're not truly recovering. It's a two steps forward, one step back kind of thing.

So. Those are just a few of the reasons I am no fan of chronic cardio (and don't get me started on the bad backs, osteoarthritis, hip and knee replacements and chronic tendonitis among my former elite endurance peers). A strong will can be a great thing for survival, for business and for relationships, but it can also get you in trouble if you don't pay attention to your training load.

Having said all that, I am still a big fan of weights, of brief, intermittent interval training and I am all for doing a fair amount of mixed low-level cardio, the kind that doesn't overstress the heart or involve so much repetitive joint motion that it causes chronic injury. That makes sense in an ancestral context. You're expending energy at a high rate, but you're not going long enough that it becomes a liability. Or, if you're going long, you're taking it easy enough that you have the energy to make it back home, possibly carrying food.

I'm not even against a long training run or ride once in a while, provided you are trained, rested and allow enough recovery afterwards. I'm even OK with running marathons occasionally or jumping into a short triathlon now and then. As a species, we obviously have the capacity to go long and relatively hard every now and again. It's the chronic, day-in, day-out long, hard stuff that is counter-productive. If you did that twenty thousand years ago, when your next meal – and that of your entire family/tribe – was on the line, when calories were somewhat precious, when you didn't have an air-conditioned caravan of trainers, massage therapists, and coolers filled with electrolyte drinks following along after you, you'd be foolish. You simply wouldn't do it.

That we can run marathons (and do other stupid things) and know that we'll get out alive is a luxury of modern living. There are so many other less damaging ways to achieve what I would call high-level adaptive fitness by using a variety of training methods, all of which can be cardio-protective and joint strengthening when done the right way in at the appropriate times. Heck, when it comes to hypertension, blood lipids, and type 2 diabetes, walking is just as effective as running - without the potential downsides. Everyone can walk. Everyone *thinks* they can run, but running is a skill that must be learned. To run with poor form is to welcome injury, doubly so if you're running an excessive amount. And all this

will be addressed in detail in my forthcoming book, *Primal Endurance*. For now, use your brain and listen to your body.

My point, of course, is that the human organism is made for short, intense bursts of activity laid atop a foundation of frequent slow moving. We aren't "supposed" to run as hard as we can for two or three hours. We're not supposed to run with the express purpose of "burning calories." We can certainly choose to do those activities, and we'll become adapted (or perhaps inured) to them, and they may even make us "fit," but they're not the healthiest, most efficient path to fitness. Chronic cardio is the meandering, roundabout trail that will get you there with a ton of bruises, scratches, a tick or two, and a sprained ankle. Oh, and you might get eaten by a bear along the way.

Your choice.