



## **California Cures!**

*How the California Stem Cell Program is Fighting Your Incurable Disease!*

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### **Chapter Fifteen: The Color of Fat**

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## THE COLOR OF FAT

Why is it some people do not gain weight, even if they own stock in an ice cream parlor? These irritating people never seem to exercise or diet, and yet they stay lean and healthy. What gives them such an unfair advantage?

It may be the color of their fat.

Every adult human has a mixture of white, brown, and beige-colored fat.

Brown fat burns off quickly, as heat and energy; the athlete's chiseled body means he/she has more brown fat. Hibernating bears and newborn humans also have more brown fat, for warmth. Infants cannot shiver, so their body thermostats are set up for heat. The beige fat is found in narrow threads; more on that later.

And we who fight the battle of the bulge? White fat is blubber, which mostly just stays stored around the middle: the gut or butt. When we "pinch an inch" on the waistline, that's white fat. And when we clutch a handful, that's obesity.

Does it matter, if we are thin or plump?

Unfortunately, it is life and death. As our weight goes up, so do our chances of Type 2 diabetes, heart disease, kidney problems, colon cancer, and stroke.

Gloria and I went to a food class last week. Every person in the room was at least mildly overweight, except the instructor. At 226 pounds, I was no exception.

During the class, the instructor looked at me and said, "You look so confused ..."

I was not confused, just overwhelmed. What she described seemed impossible. She had a pile of plastic models of various foods, and would throw them on a plate to show us how to eat. Half of the plate was for vegetables. The other half was divided into three parts, tiny little dabs of what I considered edible food.

Her idea of a big treat was a teaspoon of raisins.

Afterwards I went online and bought several cheap books on diabetes diets, and some of them didn't seem quite so impossible. My wife is inclined to be vegetarian anyway ... could we bring our weight down, adjust Gloria's diabetes blood count, make a permanent adjustment to our life style?

The odds are against it.

To live endlessly self-starving lives, hungry all the time, counting the calories in every bite? It is possible, as proven by those who fight the deadly Type 1 diabetes, where the choice is be careful or die; but most of us with weight problems just stay that way. If we lose a couple pounds, we put it right back on.

Look around you at the gym. These are people who have made a conscious commitment to lead healthy lives, and even so most of us are overweight. I go to the gym three times a week, and I still weigh too much.



Shingo Kajimura (ucsf.edu).

It is not our fault, my mind whimpers, I'm fat because the world has changed!

When I was a skinny high school freshman in 1959, we had one car, which my Dad took to work. I walked three miles to school, and three miles back, forced to exercise, and there were no fast foods. I distinctly remember my first hamburger. It was called a "butterburger," delicious and deadly. When good-tasting food like that became widely available, and more cars to cheat us from exercise, we ate too much and did too little, and a nation became fat.

There was one overweight girl at my high school, who must have weighed about 300; I had never seen anyone that big, so young. I was not rude to her, of course, but why was she built so differently? When she bounced on the trampoline in gym, it sagged almost down to the floor.

Today, people that size are not uncommon. One Californian in four (26%) is obese: dangerously overweight. And California is more health conscious than some states; nationally, the obesity index is about 35% — one in three.<sup>1</sup>

Financially? The cost of treatment for obesity-related ailments is nearly \$190 billion a year, roughly 20% of all medical costs ...<sup>2</sup>

But what if we could change white fat to brown?

There are scientists trying to do just that.

One is Shingo Kajimura. He works at the Eli and Edythe Broad Center of Regenerative Medicine, at the University of California at San Francisco.

Dr. Kajimura's lab has a stated goal: "Engineering fat cells to fight obesity."<sup>3</sup>

"Brown Adipose (fat) Tissue (BAT) acts ... as a natural defense system ... against the development of obesity... (which) has prompted

<sup>1</sup><https://www.niddk.nih.gov/health-information/health-statistics/Pages/overweight-obesity-statistics.aspx>

<sup>2</sup><https://www.hsph.harvard.edu/obesity-prevention-source/obesity-sequences/economic/>

<sup>3</sup><http://kajimuralab.ucsf.edu>

our lab to examine the links between BAT, obesity, and metabolic disorders.”<sup>4</sup>

Remember those beige cells, threaded among the blubbery white fat?

“For the first time, a research team, led by UCSF biologist Shingo Kajimura, has isolated energy-burning “beige” fat from adult humans, which (may enable us) to convert unhealthy white fat into healthy brown fat...”<sup>5</sup>

The beige fat can apparently “recruit” (change) white fat cells to brown, or least give the white fat the ability to more easily burn off, as if it were brown.

We could lose weight more easily, live longer, healthier lives ...

Shingo had (like me) an ocean background, growing up fishing almost every day, to supplement the family’s food supply. I called him for a phone interview, and it was hard not to spend our time talking about fish and sharks.

“I wondered how animals adapt to a severe environment,” he said, “Humans use shivering as a way to generate heat, but animals don’t.”

“In early 2000, only four or five labs were studying brown fat. One was led by Dr. Bruce Spiegelman, I was a research fellow under his leadership for several years.”

“In 2009, two major discoveries changed fat research: first, it was found that humans kept small amounts of brown fat from infancy into adult years, and that was correlated with (how fat they were). If they were lean, more brown fat. Second, beige cells (could) recruit white fat into brown, or at least act like brown.”

“We found a way to turn skin cells, muscle cells and white fat cells into brown fat.”

“Since most people are reluctant to undergo transplant surgeries, we are currently trying to (develop) an injection or a pill, to help a patient fight obesity by turning white fat into brown.” — Shingo Kajimura, personal communication.

<sup>4</sup>[http://www.cell.com/cell-metabolism/references/S1550-4131\(16\)30378-3](http://www.cell.com/cell-metabolism/references/S1550-4131(16)30378-3)

<sup>5</sup><http://www.theglobeandmail.com/life/health-and-fitness/health/california-researcher-wants-to-fight-obesity-with-fat-cells/article28220440/>

Another scientist with a long history of anti-obesity research is Chad Cowan from the Harvard Stem Cell Center, run by Brock Reeve, that superb organizer and fund-raiser, brother to the late stem cell champion, Christopher "Superman" Reeve. In a 2014 experiment, Cowan used stem cells as a testing device: trying to find out if there were drugs available which might change white fat into brown, or at least make the white fat function as if it was brown.

With the help of a pharmaceutical company, he ran through roughly 1,300 drugs. He found two that made the desired change, but they had dangerous side effects. Even so, the idea is valid; a larger pharma company would have access to millions of drugs, and surely some would be useful.<sup>6</sup>

Kajimura speaks highly of Cowan, crediting him with turning embryonic stem cells into brown fat, and repeating the effort with induced pluripotent stem cells.

If I had my way, scientists like Cowan and Kajimura would be locked in a laboratory, having a contest. They would not be allowed to come out (sorry, guys!) until one of them found a cure to obesity, with a huge money prize as incentive.

Well, maybe my idea is not completely practical! But, there is precedent for a massive money prize, called a Social Investment Bond (SIB). The idea is if somebody makes a positive change for society, they get a percentage of the savings it brings to the country, for an established length of time.<sup>7</sup>

So if Shingo or Chad found the answer to obesity, they would automatically become rich, and never have to worry about grant money any more. We do not have SIB grants in America yet, but the idea seems worth considering.

But even in our current system, if a person came up with a way to make everybody leaner and more fit, without nearly-impossible life style changes in diet and exercise, they should do well financially ...

I wish them (and all cure research scientists) the very best of luck.

If they win, we win.

<sup>6</sup><http://news.harvard.edu/gazette/story/2014/12/a-pill-to-shed-fat/>

<sup>7</sup>[https://en.wikipedia.org/wiki/Social\\_impact\\_bond](https://en.wikipedia.org/wiki/Social_impact_bond)