

CONCENTRATE YOUR CARBS!

Jeremy J. Stone¹

Based on seven different pillars of human knowledge, described below, concentrating the consumption of high-glycemic carbohydrates in one of the daily meals, and thus maintaining low insulin levels for the rest of the day, appears to be the most promising dietary approach to losing weight, lowering risks of degenerative disease (cancer, diabetes, heart disease, Alzheimer's disease) and strengthening chances for healthy aging. The adoption of this diet could avoid enormous suffering and go a long way toward curtailing the spiraling costs of health care. But the public will not adopt this diet widely enough without the endorsement of key scientists and medical committees.

ABSTRACT: The epidemic of obesity and of degenerative disease and the health budget crisis militate in favor of focusing on feasible and effective dietary solutions. Fortunately, if pulled together and properly interpreted, there is more than enough research already completed to advise the public of what is their best current bet, among practical and acceptable dietary regimens, i.e., without difficult to sustain 30% or 40% reductions in calories. This best bet is a Carbohydrate-Concentrated (CC) Diet, in which whatever high glycemic carbs and sugars are eaten daily are consumed in one meal and are eschewed during the other meals.

On this diet, overweight dieters can anticipate not only a loss of weight but improvements in biomarkers of health. In particular, there is evidence that most of the obese can, in this way, lose weight in a sustained way, and reduce related chances of cancer, diabetes and heart disease. They might even secure a delay in the onset of degenerative diseases such as Alzheimer's.

Seven fundamental sources of theory and data commend this dietary practice. With so much diverse support, the public should be encouraged to try it.

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This article is an effort to integrate, and update, key aspects of these sources of knowledge with a view to generating a consensus conclusion that might ameliorate the current health crisis.

To effect the integration, the paper defines a new category of diets, the Concentrated-Carbohydrate (CC) Diet. Observing that Caloric Restriction (CR) experimenters normally feed their subjects once a day and that CC diets lead to loss of weight, hence to a reduction in calories consumed, the paper is able to link the expected results of CC diets with those of the famous and long-studied CR diets.

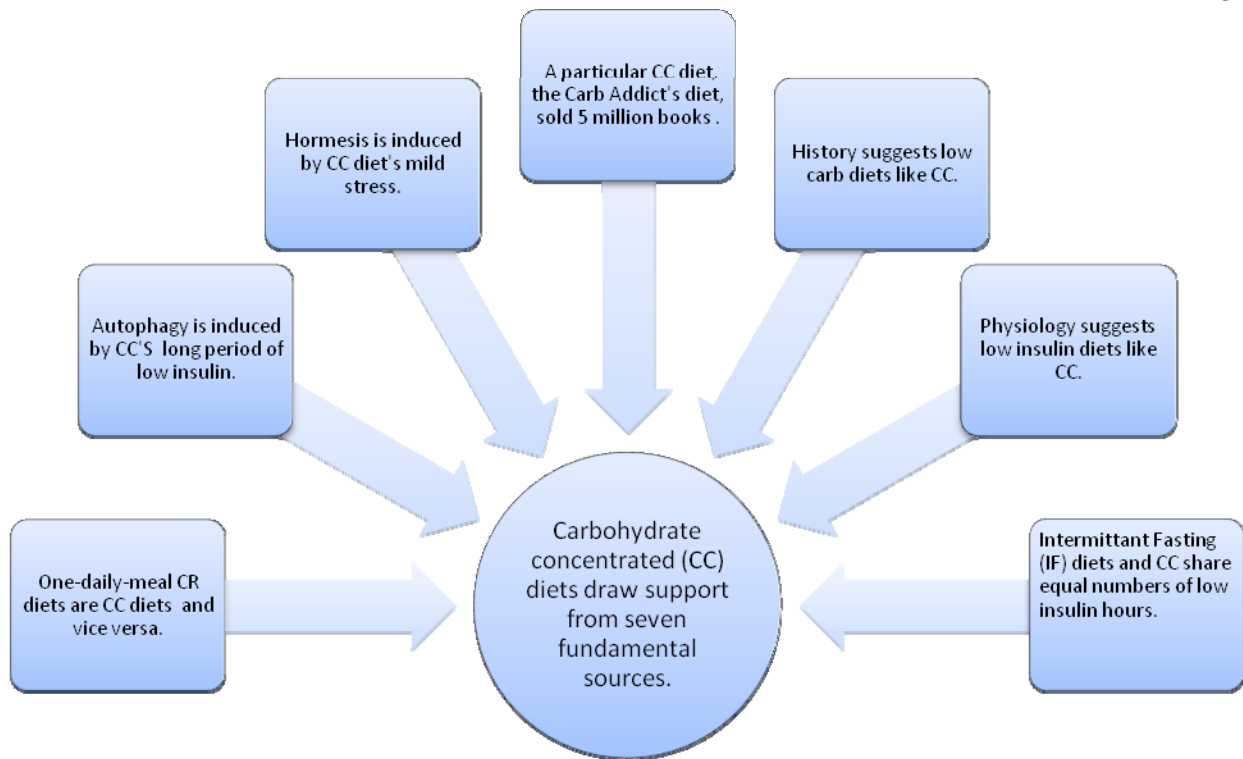
With a second observation, concerning the equality in number of hours of low insulin induced, the paper is able to link CC diets with those of the famous and long-studied Intermittent Fasting (IF) Diets.

Accordingly, it seems that CC diets may provide not only weight loss but some of the broad and far-reaching improvements in health and healthy aging--and the lower likelihood of getting degenerative diseases of many kinds--that have been well established for so long for both the CR and the IF diets.

The paper further identifies the Carbohydrate Addict's Diet (CAD) as the most feasible, tested and practical of the CC diets. The paper updates the case for that diet, and other CC diets, with observations from such new fields as Autophagy (triggered by the low-insulin hours in the diet) and Hormesis (triggered by the mild stress of the diet).

The wide variety of CC diets provides the public with a great deal of choice. The hope is that the relevant communities of expertise and commentary--in science, medicine and media--would join in recommending carbohydrate concentration with a view to promulgating and institutionalizing such diets.

Dieters would, of course, be advised to consult with their physicians before adopting and shaping a suitable CC diet and, certainly, there are patients for whom it would not be appropriate or who would have to try it cautiously.



CC DIETS ARE SUPPORTED FROM SEVEN DIFFERENT DIRECTIONS

What follows is a brief survey of seven fundamental supportive sources of theory and data for CC diets.

I. HISTORY SUGGESTS LOW CARBOHYDRATE DIETS

Low-carbohydrate diets have had an impressive record of success since 1867, when Banting's diet set off a revolution in dieting in Britain. Over the years, much evidence has accumulated to suggest that the degenerative diseases of modern civilization (cancer, diabetes, heart disease, and dementia) are, in large part, the result of high-carbohydrate diets for which the human body was not designed. CC diets limit the consumption of carbohydrates, and the insulin they produce, because the high-glycemic carbs are to be eaten in only one meal limited to one hour. Not only the Atkins low-carb diet but the Pritikin and Ornish low-fat diets restrict high-glycemic-index carbs and sugars, and for the same reason, because they raise insulin levels.

II. PHYSIOLOGY TEACHES THE IMPORTANCE OF LOW INSULIN

Insulin is central to the regulation of energy and glucose metabolism in the body; it induces cells in the liver, muscle, and fat tissue to take up glucose from the blood and store it as glycogen in the liver and muscle. When insulin is high, it stops the use of fat as an energy source. When insulin is low, the body begins to burn fat. In sum, by keeping insulin low for most of the day, CC diets burn fat and tend to keep the dieter lean. And because the window of low insulin is a long one, even the obese, who often have a high threshold for lowering insulin, can benefit from the diet. Moreover, in general, for most people, nothing is more important to their health than losing weight and staying lean. Further, the diets will avoid insulin resistance, increase insulin sensitivity and have a large variety of resultant health advantages.²

III. CC DIETS HAVE BEEN SHOWN TO BE HIGHLY ACCEPTABLE

The Carb Addicts Diet (CAD) of Dr. Rachael F. Heller and Dr. Richard F. Heller, first published in 1993, is a three-meal-a-day diet in which the eating of carbohydrates is concentrated in a single daily meal of no more than an hour's duration.

The tremendous popular success of this diet showed that there is a practical way to induce even the most hardened carbohydrates addicts to keep their insulin low and to do so for the longest possible daily window (short of forgoing the significant eating of carbohydrates all-together.) The Hellers' book has had five million copies printed.³

The Carbohydrate Addict's diet was developed by Dr. Rachael Heller to deal with her own weight problem. Painfully and hopelessly overweight, she learned, by accident, that restricting the eating of carbohydrates in her diet to one meal a day would lead to weight loss and a reduction in carbohydrate cravings.

²For the expert reader: there is a significant amount of information on the unfortunate effects high insulin levels have on the biological system. TOR is activated, this in turn activates cell proliferation and cancer growth. Insulin also inhibits another effector regulator, the energy sensor AMPK. When AMPK is inhibited it turn off fat oxidation and turn on fat synthesis. Inhibition of AMPK also turns off mitochondrial biogenesis and this leads to an accumulation of old-worn-out mitochondria. Furthermore, TOR activation inhibits autophagy.

³ A splendid review of the many low-carb diets can be found in "The Secret to Low Carb Success! How to Get the Most Out of Your Low Carbohydrate Diet" by Laura Richard (Kensington Books, 2001), wherein these diets are nicely summarized and their popular appeal analyzed. This discussion of the Hellers' diet is drawn in part from her summary.

She lost 150 pounds on this diet and kept it off for nearly 20 years. Her husband, Dr. Richard Heller, also suffering from obesity, helped her apply the relevant physiological principles, and in 1983, they founded the Carbohydrate Addicts' Center in New York City. Over the next 20 years, they claimed an 80% success rate in reducing weight and maintaining the weight loss among their clients. (See Laura Richard, *op. cit.*, pg. 43).

The Hellers believed that the primary cause of obesity was the “overproduction of insulin brought on by too much carbohydrate in the diet.” They believed that the level of insulin would become chronically elevated, causing the blood sugar levels to drop too low. This would cause hunger and a return to eating. They also believed that, because of the chronic elevation, the nervous system would not release the serotonin that normally lets the body know it is no longer hungry, which would further encourage a return of hunger.

The Hellers believed that 75% of all people who are overweight, and many of normal weight, were carbohydrate addicts, and they provided a quiz for patients to determine how addicted they were. They believed:

“...that some foods, particularly simple carbohydrates, are addictive substances much the same as alcohol and drugs. According to their theory, carbohydrate addicts are overweight people who have an intense, compelling, recurring, and gripping hunger and craving for foods rich in carbohydrates, primarily foods composed of simple, refined sugar. The Hellers believe that carbohydrate addiction is similar to other addictions in that the intensity of the cravings escalates over time.” (pg. 44, *ibid.*)

The Hellers believe that eating carbohydrate at all three meals causes a constant release of insulin. A graph from the Dr. Bert Heller's pamphlet, available at the Fast-5.com website, shows what happens to both the person of normal weight and the obese person if they eat three meals and a snack. For the obese, the insulin level never gets below a threshold above which insulin is preventing fat from being turned into energy. And for the non-addicted, it is rarely low enough to cleave fat except for the middle of the night because by the time the insulin declines, it is usually time for another meal or snack and the insulin levels jumps up again.

"The Hellers emphasized that “...you need to maintain a moderate level of physical activity (not necessarily a rigorous exercise plan) to help make the diet work for you.” From their point of view, it was a “return to normal insulin balance

that eventually produces weight loss in the carbohydrate addict”.

However, exercise is important in many ways and it is more effective in reducing fat if it is done at low insulin levels. Happily, CC diets, including the CAD diet, maximize the dieter’s daily periods of low insulin and so maximize the chance that any exercise done by the dieter will be maximally effective.⁴

CC dieters who skip one of the complementary meals should be especially sure to take a good multivitamin, as indeed everyone should. And there is much now known about useful supplements that can complement CC dieting that was not known when the Carb Addict's Diet was first published. But this is a subject for a different paper.

The Hellers' also urged the avoidance of excessive saturated fat saying: "If the food you eat is high-carbohydrate, tastes sweet, or is high in saturated fat, your body releases insulin into your bloodstream in anticipation of the coming food energy."⁵

It is important to observe that not all obese people are examples of carbohydrate addicts. But the addicts would seem to be the hardest case and, as

⁴⁴ For example, a 2010 study reported: "Exercise is an important part of obesity treatment concepts to support fat mobilisation from adipose tissue...it is well known that stimulation of plasma insulin levels by a carbohydrate meal can inhibit lipolysis and subsequent fat oxidation...To improve exercise-induced lipolysis and subsequent fat oxidation during low-intensity exercise obese subjects should not ingest carbohydrates immediately before exercise...When carbohydrates are consumed 2 h prior to exercise its lipolytic effect is comparable to the protein meal. Effect of carbohydrate- and protein-rich meals on exercise-induced activation of lipolysis in obese subjects; Erdmann J, Tholl S, Schusdziarra V. *Horm Metab Res.* 2010 Apr;42(4):290-4. Epub 2010 Jan 21.

⁵ pg. 110 of *The Carbohydrate Addict's Healthy Heart Program* (1999). They said the "mechanisms that lead to fat-related hyperinsulinemia and the changes that result from that hyperinsulinemia are not yet understood in detail." However, it is known that Palmitic acid, a saturated fat promotes insulin insensitivity and diabetes. See *Nephrol Dial Transplant.* 2009 Nov;24(11):3288-96. Epub 2009 Jun 25; Saturated fatty acids induce insulin resistance in human podocytes:implications for diabetic nephropathy. Lennon R. et al.

the experiment below indicates, the unaddicted also lost weight by concentrating carbs. Not all persons lost weight on the Hellers' diet; they once said that they thought they had an 80% success rate. But based on the six other pillars of evidence for a low insulin carb controlled diet, it seems that, in the absence of special information on special physiological problems, maintaining a low insulin level and concentrating carbs is the strategy most indicated.⁶

The Hellers' Experiment Supported Carbohydrate Concentration

The Hellers did an experiment in which carbohydrate consumption was, in the control group, spread among three meals and then, in a second group, concentrated in a single meal. They reported (pp. 43-44 of *The Carbohydrate Addict's Diet*):

“We measured the subjects' experience of hunger and their weight change. The results showed that the frequency of carbohydrate intake affected both the carbohydrate addicted and nonaddicted groups' experience of hunger and weight. But it affected carbohydrate addicts at a much higher level. Both weight levels and hunger increased in direct proportion to increases in carbohydrate meal frequency.”

They reported that this diminution in cravings and significantly greater weight loss in the CC group appeared to have been caused by:

“1). Lowered insulin production and/or release;

⁶ Insulin response depends upon the specific nature of calories and not just whether foods are high glycemic or not. There is a relatively new insulin index, patterned after the glycemic index, with a correlation of .7 between the two indices. Protein-rich foods and bakery products (rich in fat and refined carbohydrate) both had insulin responses that were disproportionately higher than their glycemic reading. Dairy products have a low glycemic index but a notably high insulin index. Strictly speaking, maintaining the lowest possible daily insulin profile would require going beyond concentrating "carbs" and trying to concentrate everything with a high insulin index rather than just things with a high glycemic index. See SH Holt, JC Miller, and P Petocz, *An insulin index of foods: the insulin demand generated by 1000-kJ portions of common foods*, *Am J Clin Nutr* 1997 66: 1264-1276 [Am J Clin Nutr](#) .

2). An increase in receptor sites (due to the decrease in insulin), with an accompanying increase in the rate at which insulin is removed from the blood.”

Their book was published in 1993. Six years later, in 1999, they discussed the case for their diet in greater medical detail in “The Carbohydrate Addict’s Healthy Heart Program” (Ballantine Books) with a cardiologist, Dr. Frederic J. Vagnini, as a co-author. He had lost 90 pounds on the diet and kept it off for a decade.

They believed that lowering the insulin level was the key. Low insulin would permit the patients to lose weight. And with this weight loss would come (pg. 14):

- a). Reductions in blood pressure levels;
- b). Reductions in total cholesterol levels by 25 to 60%;
- c). A rise in good cholesterol (HDL) levels;
- d). Sharp declines in dangerous triglyceride levels;
- g). Normalization of blood-clotting abnormalities and important aspects of arteriosclerosis and heart disease;
- h). Improvements in the condition of many adult-onset diabetics, including better blood sugar control; in some cases, with their doctors’ monitoring and guidance, they were able to greatly reduce insulin therapy or stop it altogether.

The Hellers said, “. . . diet experts have failed to treat the problem by reducing the total daily intake of carbohydrates and distributing carbohydrates equally to all meals. We know that these strategies don’t work for carbohydrate addicts . . . Through our research we discovered that it isn’t only the amount of carbohydrates eaten that matters—it is also *how frequently* they are eaten. Frequency governs, in large measure, the hunger response for millions of people. Personally and professionally, we discovered that any weight-loss diet that prescribes three or more small meals each day containing carbohydrates will ultimately fail with the carbohydrate addict. Such a diet will trigger the insulin response and signal the carbohydrate addict to eat once again.” (pg. 29; *ibid.*)

In sum, the Hellers’ Carb Addict diet was based on developing the longest possible daily window of low insulin levels—viz., about 19 hours.

CAD is one of a family of carbohydrate concentration diets, of which the others normally suggest less than three meals. The CR Way, for example, written by the President of the Caloric Restriction Society, advocates one meal a day (see

<http://www.caloricrestriction.org/>) and tries to keep insulin levels very flat indeed by measuring glucose.

A related approach, called FAST-5, invented by Dr. Bert Herring and installed on the Fast-5.com website, advocates restricting eating of all foods—which, of course, includes carbohydrates—to five hours and fasting for the rest of the day. So this can be considered a CC diet with a five-hour meal!

Unfortunately, these last two diets, which have also been called “daily mini-fasts” are less likely to be supported by the medical profession because they involve “meal-skipping.” And they are less likely to be accepted by the public at large because they appear to be too difficult to adopt and maintain, even if, in fact, they are not. But, in particular, by requiring that one or more meals be dropped, they cause problems among those who are using meals for social or business purposes.

Still another diet that restricts carbohydrates through a daily fast is the Bahadori Leanness Program (BLP) of “mini-fast with exercise.” Under this program, every 24-hour period includes a fast of 12-14 hours, much as if it were Ramadan every day. (Studies done of Moslems after Ramadan show increased health.)⁷

An examination of these and other CC diets indicates that the CAD diet is the most likely of them all to win permanent institutionalized acceptance and would do so, if scientists endorsed it and doctors began recommending it.

IV. CC DIETS ARE LIKELY TO SECURE THE BENEFITS OF CALORIC RESTRICTION (CR) DIETS.

In the 1930s, it was discovered that restricting the nutrition of mice reduced the incidence and severity of many of the diseases that limited their lifespan and could make them live longer, sometimes even 40% longer.

For eight decades, in more than 1,000 experiments, the scientific community has broadened this result. It has learned that such dietary restriction was broadly

⁷ For thoughts on possible benefits, see McCarty MF, Falahati-Nini A. Neuroprotective potential of the Bahadori leanness program: a “mini-fast with exercise” strategy.; *Med Hypotheses*. 2007; 685): 935-40.]

successful in an extraordinary range of living things even outside the animal kingdom. Among animals, it seems to work with spiders, fruit flies, nematodes, rodents, zebrafish and, especially important for extrapolation to humans, nonhuman primates.⁸

How was it done? After a review of more than 800 articles on Caloric Restriction, Spindler reported: "We know that it is possible to extend the mean and/or maximum lifespan of mammals by reducing dietary calories, protein, methionine, or tryptophan; or by reducing insulin and/or IGFI signaling [ed.note: reducing insulin is the method being advocated here]."⁹

What about the healthy aging of humans? Spindler said:

"...studies in humans indicate that CR produces many of the same physiologic, hematologic, hormonal, and biochemical changes produced in species which experience lifespan extension. In human, nonhuman primates and rodents, CR provides protection from type 2 diabetes, cardiovascular and cerebral vascular disease, age-related immunological decline, malignancy, hepatotoxicity, liver fibrosis and failure, sarcopenia, systemic inflammation and DNA damage."

We turn now to the questions of whether these benefits of Caloric Restriction can be achieved by Carbohydrate Concentration dieting. The answer seems surprisingly affirmative.

Caloric Restriction Diets are CC Diets in Most Cases

⁸ Twenty- year experiments with caloric restriction in primates have been very successful according to Stephen Spindler's "Caloric Restriction: From soup to nuts", where he said (p. 325):

“Studies from two colonies of rhesus macaques suggest that the effects of CR in nonhuman primates recapitulate many of the physiological, hematological, hormonal, immunological, and biochemical effects produced in rodents. Approximately 30% CR (a 30% reduction in calories) initiated in macaques of various ages, decreases body weight and adiposity; improves glucoregulatory functions and increases insulin sensitivity; produces favorable changes in blood triglyceride and lipid profiles; reduces serum levels of C-reactive protein; delays male skeletal and sexual maturation; delays the age-associated decline in serum dehydroepiandrosterone and melatonin normally found in ad libitum fed controls; reduces oxidative damage in skeletal muscle; and attenuates the development of sarcopenia.”

⁹ *ibid*, p. 342.

However, in perhaps 90% of caloric restriction experiments (private communication and see¹⁰), the experimenters do not meter the food but provide it all at one time to the animals, who, being hungry, most of the time eat it all at once. Accordingly, a very large number of these caloric restriction experiments are really experiments in a carbohydrate concentration diet, i.e., all the carbohydrates in the diet are being offered at one meal, albeit with a limit on calories as well!

And the CAD is a CR Diet because it Restricts Calories

But the adherents to the Hellers' Carbohydrate Addict Diet lost weight—often a great deal of weight—hence they must also have been restricting their calories, albeit through the mediation of a lower appetite induced by keeping insulin levels low and the frequency of consumption of carbohydrates down to a minimum. Further, there is no indication that, after achieving the weight loss, that their caloric intake increases. On the contrary, they have learned to live on less. The author's crude estimate is that he is eating about 25% less on a one-meal a day plus snack diet than he eat when he was eating three meals a day.

Accordingly, the CC diets, even if they contain three meals, are exercises in caloric restriction! And, as noted, the animal exercises in caloric restriction have been, historically, with some exceptions, CC diets in that they limited all consumption to one meal hence all carbohydrates to one meal.

This equivalence suggests that adherents to CC diets will share, qualitatively at least, in the success of many hundreds of caloric restriction experiments.

Interestingly, the Hellers reported that many CAD adherents did not want or need one or more of the other two “complementary” meals. The author understands this quite well. Before he learned about any of this, he began by skipping dinner to lose weight and quickly fell into a diet of one big meal a day plus at most one daily snack, which he has maintained for more than a year. In effect, his diet is much like that used by the caloric restriction experimenters who fed their animals once a day.¹¹

¹⁰ In general experimental studies, food is provided once daily. When DR animals are provided with food, they eat all of it within approximately 1 hour. After that, animals have no access to food and are under fasting conditions for the next 23 hours (Kouda et al., (2000) Low-energy diet in atopic dermatitis patients: clinical findings and DNA damage. *J Physiol Anthropol Appl Human Sci* 19: 225-228

¹¹ And Stone, who is 74 years of age, lost 25 pounds in one year and improved his health in numerous ways (viz., his sense of smell returned, he was less allergic, his problem with an overactive immune system resolved, and his memory improved).

V. CC IS LIKELY TO SECURE THE DESIRABLE BENEFITS OF IF

In the first place, surprisingly, intermittent fasting (IF) diets, in which subjects are fed ad libitum on one day and fasted on the next, have produced quite similar results to those of caloric restriction--a long and positive list of healthy aging advantages.

The evidence for the similarity of benefits of CR and IF lies in an extraordinarily interesting table comparing energy restriction (restriction of calories) versus intermittent fasting on rodents and primates from a 2005 review article by Mark P. Mattson in Table 1.¹²

The table compared the physiological changes associated with energy restriction (i.e., caloric restriction) on seven blood indicators (Glucose, insulin, IGF-1, triglycerides, LDL cholesterol, HDL cholesterol and ketones) in one column against a second column for intermittent fasting.

The body response on these seven indicators is seen to be amazingly similar. In both cases, glucose and insulin decreased. In both cases, LDL decreased or there was no change. With regard to ketones, intermittent fasting showed no change or increase respectively for CR and IF. With regard to IGF-1, caloric restriction led to a decrease while intermittent fasting led to “no change or increase.” HDL increases with caloric restriction and shows “increase or no change” for intermittent fasting.

For five cardiovascular and muscle results (blood pressure, heart rate, insulin sensitivity and lipid accumulation), the results were much the same and improved. For the brain, the results on cognition and motor function were the same--in both diets there was improvement. With regard to neurogenesis, measures for CR and IF showed no change or improvement respectively. And with regard to brain-derived neurotrophic factors (BDNF) and filial cell line-derived neurotrophic factor (GDNF), intermittent fasting showed an “increase” rather than the “no change or increase” of CR. What this shows is that CR and IF almost always improved biomarkers and, in particular that they improved almost precisely the same biomarkers.

¹² “Energy Intake, Meal Frequency, and Health: A Neurobiological Perspective” [Annu Rev Nutr 2005, 25:237-60], pg. 242, Table 1.

Now results on rodents, and even on Primates, might not translate into the same results on humans and there is a shortage of human experiments and those that have been done are not, we read, always easy to interpret. But this table shows an incredible association of positive results. For all those who are unable to wait for years for human experiments to be completed, the table indicates that diets associated with CR and IF may be the best current dietary bets.

By Transitivity, CC Diets Should Secure the Favorable Benefits of IF Diets

If CC and CR diets can be expected to have, qualitatively, more or less the same good results--as shown earlier--and CR diets and IF diets do also--as shown in the above table summary--then it would seem to follow by transitivity that the CC diets would have the favorable results of the IF diets as well.

But a direct confirmation of this analysis arises by observing that the CC diets generate, on average over two days, comparable hours of low insulin to those hours generated by the IF diet.

For example, a few hours after the CC dieter consumes all his significant carbohydrates in one hour-long meal, the insulin level will decline to a low level. Thus, in every 24 hour period, the dieter receives about 19 hours of fasting. As a result, over the course of 48 hours, the dieter is fasting for about 38 hours.

Guess what? This is about the number of hours that the alternate day (IF) dieter has low insulin since the dieter eats all he wants on one day and then skips from one dinner to the second breakfast.¹³

So it appears that an extended low insulin level is the key. And this seems confirmed by a 2009 review paper¹⁴, in which Mattson wrote:

¹³ There is an excellent book on the application of alternate-day dieting to humans by two medical doctors, Drs. James B. Johnson and Donald R. Laub, Sr. [The Alternate-Day Diet; G.P. Putnam's Sons, 2008]. It advocated ad libitum eating on one day and 25-30% of normal calories on the down day--although one of the authors practiced 50% on the down day. The book is phrased in terms of what is required to turn on the SIRT1 gene. And the authors believe that one meal-a-day diets are not very efficient in doing so. But the real issue in comparing a CC diet and an alternate-day diet is the feasibility of adoption by humans. The number of people who will adopt the Carbohydrate Addict's Diet is certainly far higher than those number who would organize their lives around an alternate-day diet.

“Therefore, it is proposed that CR either increases glucose effectiveness or insulin responsiveness or both, and that the maintenance of low levels of glucose and insulin control the beneficial and life-extending actions of CR . . . Overall, from many experimental studies, CR and IF (intermittent fasting) seem to chronically reduce the circulating levels of insulin resulting in an eventual enhanced glucose mobilization and an enhanced insulin sensitivity, both of which serve to maintain a supply of glucose for the vital organs, central nervous system and gonads to support these critical organs in time of limited energy intake.”

That the effectiveness of CC diets is based on windows of low insulin is not just based on Mattson’s suggestion, above. The idea that low-insulin hours are at the base of the effectiveness of CR and IF diets arises also from evidence from history, physiology and dietary practice such as that produced by the Hellers’ CAD diet. In particular, much evidence indicates that those carbohydrate addicts whose normal insulin levels were too high to eliminate fat required substantial declines in insulin levels, over significant numbers of hours, to lose weight.¹⁵

VI. CC DIETS ARE LIKELY TO TRIGGER DESIRABLE AUTOPHAGY

There appear to be tight connections between aging, degenerative diseases, and autophagy—the process by which individual cells, sensing a lowering of nutrient supply, begin recycling their cellular garbage to secure the resources they need. Indeed, this process of cleaning up the cells through autophagy initiated by fasting has been called, by Dr. Ana Maria Cuervo, the ultimate cleansing diet.

Unfortunately, autophagic processes undergo a steady loss of function with age. A still more unfortunate fact: this compromised autophagy is linked to diverse degenerative diseases, including “certain types of cancer, muscular disorders,

¹⁴ Caloric Restriction and Intermittent Fasting: Two Potential Diets for Successful Brain Aging,” *Ageing Res Rev*

¹⁵ There are some studies of 40% CR on non-humans suggesting that meal frequency does not change the results of CR on lifespan. But shifting from one meal a day to two meals a day, while at a 40% reduction in calories, is unlikely to produce significant change in the insulin levels so these experiments may not be relevant to lower levels of restriction. [Temporal pattern of food intake not a factor in the retardation of aging processes by dietary restriction; *J Gerontol A Biol Sci Med Sci*. 1995 Jan;50A(1):B48-53. **Masoro EJ, Shimokawa I, Higami Y, McMahan CA, Yu BP.**]

metabolic alterations, including some complications of the diabetic syndrome, infectious diseases and protein conformational disorders, among which neurodegenerative diseases stand by themselves in their well-established connections to the autophagic process.”¹⁶

In a review of more than 800 papers on Caloric Restriction, Stephen R. Spindler summarized a number of results by saying: "These results suggest that autophagy is required for the CR-related longevity response. However, enhanced autophagy does not appear to be sufficient for lifespan extension."¹⁷

It is now believed that autophagy is triggered by low-insulin signaling. Accordingly, the effect of CC diets--keeping the longest possible daily windows of low insulin--is likely to jump-start the aging cellular mechanisms of autophagy about as much as one could do short of fasting for days or weeks.¹⁸ It is quite possible, however, that, as persons reach advanced ages, in order to trigger sufficient autophagy, they would need to move beyond the Hellers' diet to fasting for a day a month or a day a week.

VII. CC DIETS TRIGGER HORMESIS THROUGH DESIRABLE STRESS

Stress, if it is not too great, can induces organisms to become stronger through a process called Hormesis. And how is this done? Mattson and Calabrese report:

“...diet and exercise induce a state called ‘mild metabolic stress’, where levels of glucose and the molecular energy currency, ATP, are depleted. Cells respond to this by activating stress-response pathways that increase their ability to take up

¹⁶ Cuervo, AM. Autophagy and aging: keeping that old broom working”; 5 November 2008; Cell Press.

¹⁷ See “Caloric Restriction: From soup to nuts”; Ageing Res Rev 9 (2010) p. 337

¹⁸ “Caloric restriction (CR) and lower insulin levels may slow down many age-dependent processes and extend lifespan. Recent evidence is reviewed showing that autophagy is involved in ageing and in the anti-ageing action of anti-ageing calorie restriction: function of autophagy declines during adulthood and is almost negligible at older age; CR prevents the age-dependent decline of autophagic proteolysis and improves the sensitivity of liver cells to stimulation of lysosomal degradation; provides protection of autophagic proteolysis from age-related decline co-varies with the duration and level of anti-ageing food restriction like the effects of CR extending lifespan; the pharmacological stimulation of macroautophagy has anti-ageing effects.”

glucose in response to insulin. This hormetic reaction is, in part, why exercise and dieting help prevent diabetes.”¹⁹

Since the CAD diet, or any other CC diet, does stress the body by depleting exactly these levels of glucose, the body can be expected to benefit from the diet’s stress.

In this article, they said stress induces “squadrons of defense molecules” that, once rallied “not only deal with the immediate threat but also increase resistance to other threats. They can even repair existing damage.”

He argued: “...feeding rats and mice only every other day improves the health and function of their brains, hearts and other organs . . . mice and rats on similar feeding regimes develop fewer cancers, are less prone to neurological disorders and live 30 per cent longer than their siblings that were fed every day. Metabolic stress is important for these effects²⁰

In what we deem to be further support of what we are calling CC diets, Mattson has written “Interestingly, increasing the time interval between meals can have beneficial effects on the brain and overall health of mice that is independent of cumulative calorie intake.”²¹ Of course, not all the CC diets increase the time interval between meals, but they all increase the time interval between serious ingestion of high glycemic carbohydrates, and that seems, from the above, to be the point.

VIII. EXPECTATIONS FOR LATE ADOPTION OF CR

According to Spindler, "...studies suggest that longer-term CR initiated in older humans reduces blood pressure, systemic inflammation, myocardial fibrosis, and other risk factors for cardiovascular disease". Moreover, a study of sedentary, nonobese middle-aged men and women randomly assigned to a 20% CR diet or 20% more exercise or just a "healthy lifestyle" found that both CR and exercise "produced similar reductions in coronary heart disease risk factors including

¹⁹ When a little poison is good for you; New Scientist, August 6, 2008

²⁰ Ibid

²¹ Meal size and frequency affect neuronal plasticity and vulnerability to disease: cellular and molecular mechanisms; J Neurochem 2003 Feb; 84(3):417-31

adipose mass, plasma LDL-cholesterol, total cholesterol/HDL ratio, homeostasis model assessment of insulin resistance index, and serum C-reactive protein levels."

He reported that little was known about how CR will "affect the immune system of humans, especially elderly humans."²² But "just 3 months of 20% CR in elderly humans significantly improves verbal memory scores, in concert with a decrease in fasting plasma levels of insulin and high sensitive C-reactive protein."²³

VIII. CC DIETING WILL BE OVERSEEN BY DOCTORS

All diet proposals include recommendations to patients to consult with their doctors, and carbohydrate concentration diets are no exception, of course. This is more than a pro forma statement in this case, and certainly not all diets fit everyone.

It may not be good for diabetics, for example, to concentrate their eating of carbohydrates in one meal. They may well find it easier to manage their insulin in other ways, for example, with many small meals.

Similarly, many elderly patients have serious underlying medical conditions that doctors will want to take under consideration in deciding whether to let them concentrate their carbohydrates in one meal. In particular, it has been suggested that "low body weight in middle aged and elderly humans is associated with increased mortality" and that, to maximize lifespan, one should maintain a caloric intake sufficient to maintain a suitable BMI.²⁴ But carbohydrate concentration does not force dieters to continue to lose weight beyond a level that they desire. Loss of weight tapers off in all diets, and, in diets like these, with three meals a day permitted and no law requiring them to be followed strictly, the diet should not be an obstacle to maintaining such weight as is desired.

Obviously, also, there should be more clinical studies on how carbohydrate concentration diets work, their metabolic effects and how best they should be designed. In discussing their CAD diet, the Hellers emphasized that the recommendations of the Department of Agriculture, the Surgeon General of the United States and the American Heart Association "and, in particular, low-fat and/or low-cholesterol dietary choices" are "easily incorporated into, and are

²² op.cit. p. 338

²³ op.cit. 339

²⁴ Spindler, op.cit. pg. 343.

completely compatible with” their diet.²⁵ For example, the complementary meals could even feature plant fat and plant protein--which might be helpful in decreasing IGF-1 levels-- or fish or poultry.

In other words, Americans can adopt a CC diet and a). eat whatever they want in the main “reward meal” and b). follow any dietary preference they want in up to two complementary diets except that they should avoid high glycemic carbohydrates and sugars at those meals.

²⁵ op. cit., pg 206

Not to be forgotten, also, is their right to just skip one of two possible complementary meals if they want. In sum, carbohydrate concentration is a very free-form diet. Just concentrate your carbs in one satisfying meal and follow whatever dietary plan you want in the other two.

CONCLUSION--CC DIETS SHOULD BE INSTITUTIONALIZED

An American's decision on diet is the resultant of information from a variety of sources--in particular from the scientific community, the medical community, and the food commentary media. Each community has its own conception of what provides "proof," and the communities are only loosely linked together. Can they be persuaded to support CC diets with sufficient consensus to make the diet a fixture in American life?

It is not considered politically correct for scientists to give the public advice on which not all scientists have agreed--and not all experiments have been done. But, in matters of diet, there never will be a time when all relevant experiments have been completed on all possible patients, their conditions and their supplements.

It would seem therefore that with so many successful, and mutually supportive, experiments on CR and IF--and considering the close links between CC diets and both CR and IF--it should be possible to induce scientists, and their institutions, to speak up in support of CC dieting as a timely conclusion of their important work over eight decades.

At some point, in any case, they have to turn the problem of implementing such dieting over to physicians able to assess the suitability of the diet for individual dieters and to watch the patient's progress over time.

The medical community reaches consensus through the advice of committees of eminent practitioners whose conclusions change slowly--as they say, funeral by funeral. But the urgency associated with the epidemic of obesity alone, if nothing else, should galvanize the attention of the system. Moreover, individual doctors, facing a rising tide of sick patients with difficult issues, will have to focus on the critical question: "What diet do you recommend?"

Without support from these two communities, even the most successful and popular diet will eventually run its course as the number of those who respond to

the attendant publicity of a book or TV appearance run out and word of mouth slows. We call for their help.

Scientists and physicians may find some of the seven pillars of support for CC diets more persuasive than others. But, taken together, the case for CC diets appears overwhelming. Moreover, the diet, if widely adopted, seems capable of addressing the epidemic of obesity and degenerative disease and helping contain the rise in health costs. In sum, CC dieting seems a good bet for the public and for the health system.