THE ROLE OF INSULIN:

INSULIN RESISTANCE – Syndrome X
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Insulin is a hormone, a messenger in our body, released by the pancreas to help cope with high levels of sugar in our bloodstream. Insulin's role is to stimulate the cells to capture this sugar, and either burn it for energy as needed then and there, or convert it to a storage form of carbohydrates for reserve energy called glycogen.

When the body is continually assaulted by foods containing high levels of simple sugars, the cells become resistant to insulin. Insulin left free in the bloodstream cannot perform its function of lowering sugar levels.

In 1978, one quarter of Americans were overweight, as defined by a body mass index (BMI) of 25-30 kg/m^2, and in 1990, one third were overweight — a 33% increase. **The latest figures from the Centers for Disease Control and Prevention show that 60% are now overweight.** Similarly, the prevalence of obesity (defined as a BMI of >30 kg/m^2) increased from 12% in 1991 to 19% in 1999.[1] It has been estimated that 300,000 deaths per year are attributable to obesity, and that it accounts for nearly 10% of national health costs. (Mokdad AH, Serdula MK, Dietz WH, et al. The continuing epidemic of obesity in the United States. JAMA. 2000; 284:1650-1651.)

In 2002, rates continue to increase, rising to nearly 65% of adults from 56%, while rates of *extreme* obesity increased to nearly 5% from 3%.

The pancreas is therefore stimulated by sugar's continued presence to produce more insulin, and a vicious cycle is in place. High Insulin levels lead to more fat cells (inefficient burners of glucose) and fewer lean muscle cells; more fat cells mean more weight, less ability or desire to exercise, ergo less glucose burned . Consider these figures:

Health experts now believe that they have identified insulin resistance as the common factor explaining the increase of chronic disease in the United States. A huge 2004 study of over 39,000 in 40 countries people made an incontrovertible connection between high blood sugar and cardiovascular disease. About half of the subjects were men, averaging 63 years of age, and the researchers determined that only one man in three had normal glucose and insulin levels. I in 5 had diabetes that had gone undetected, and over 1 in 4 had pre-diabetic readings. This emphasizes the importance of controlling blood sugar.

Insulin Resistance accounts for the otherwise inexplicably higher number of **overweight** people in this country, which is occurring at the same time a Health Club a day opens, and people are watching their

diets with almost religious fervor. Some call it "**insulin resistance ", some metabolic syndrome, or syndrome X,** but all of these names describe the reaction in our body which *prevents insulin from docking with its receptor sites in our cells*.

The problem at its most basic is that the sugar not removed from the blood has to have an end goal, and that is either to be stored as fat, or to be converted into triglycerides: and as we all know, obesity and high triglycerides present us with many undesirable bills, which eventually have to be paid. Out of control blood sugar is also a definition of diabetes.

Consider the following:

Diabetes epidemic in the USA 2000–2050

Original article:
Projection of diabetes burden through 2050. Impact of changing demography and disease prevalence in the U.S. Boyle JP, Honeycutt AA, Venkat Narayan KM, Hoerger TJ, Geiss LS, Chen H, Thompson TJ. Diabetes Care 2001; 24: 1936–40.

Summary and Comment
The authors of this article have predicted that the number of individuals with diagnosed diabetes in the USA will increase by **165% in the next 50 years**, rising from 11 million in 2000 to 29 million in 2050. The biggest percentage increases are projected to be among those aged 75 years and over (336%) and among Afro-Americans (275%).
These predictions are consistent with the trend seen in virtually every developed nation [1], where, in addition, diabetes ranks as one of the top two causes of blindness, renal failure and lower limb amputation. Through its effects on the cardiovascular system (nearly 80% of people with diabetes die of cardiovascular disease), it is also now one of the leading causes of death. Similar patterns are emerging in most developing nations [1, 2]. Recent estimates by the International Diabetes Institute and WHO suggest that the global number of persons with diabetes will rise from 151 million in the year 2000 to 221 million by the year 2010, and to 300 million by 2025 [1]. This rise is predicted to occur in virtually every country throughout the world, with the greatest increases expected in developing countries, particularly in Asia.

If you are "**apple-shaped**" (see RESOURCES), your health is at greater risk.

One cause of this imbalance is that when Americans cut out fat, as they have been encouraged to do in recent years, **they all too often substitute with fat-free products that are very high in carbohydrates, and in fact imbalance, or load, their diet with carbohydrates.**
For many years, athletes believed that this is the route to better performance, but new studies dispute that theory. What we are finding now is that a ratio in our diet of approximately 30% protein to 30% fat to 40% carbohydrates more closely approximates the ideal – not empty carbs, however, but carbs from complex sources, such as whole grains, fruits and veggies.

My own husband, finally convinced that he has a metabolic problem, watched in awe as the fat almost melted off him with this approach.

He had allowed himself to reach a weight of 220 lbs, almost 40 lbs more than he needed, and even though he was running every day and eating a healthy diet (after all, he does eat at my house!) he still could not lose weight.

He began to limit his carbohydrates to 40 grams per day, and his calories to app. 1000. He used Ketostix to confirm that his body was in what Dr. Atkins calls "Benign Dietary Ketosis". And in the first week, he lost nineteen pounds. Nine weeks later, he was at his target weight, and sensible eating and exercise have kept him there ever since. He is not the only person I have seen benefit from this plan, by any means: but there is no doubt it is not for everyone. I, personally, suffered through the diet for 2 weeks, and lost not a pound! Barry Sears book called *Enter the Zone,* gives a very detailed account of this approach and some extremely impressive results in many intractable health problems. I do not agree with all that he writes, but the diet he recommends is excellent.

Five or six small meals a day, balanced to the figures suggested above, and relying on lean proteins, whole grains **, fruits and vegetables, unsaturated oils from good sources and eliminating caffeine, excessive alcohol and soft drinks will bring about a very positive change in insulin balance, and therefore weight and health.

What can be done to control Insulin Resistance?

- **First** and most important, limit your intake of simple carbohydrates.
- Choose complex carbohydrates with low glycemic indeces and a low glycemic load (see RESOURCES)
- **Second**, if carbs are to be eaten, make sure they are accompanied by FIBER and FRIENDLY FATS. This will slow their absorption into the blood stream, and also slow the rate at which the body demands insulin.
- **Third** – Exercise. Not just aerobic, but weight lifting. Controlling body fat is more important than actual pounds! Remember, too, that muscle is more metabolically active than fat: just sitting doing nothing, muscle burns more calories than fat, so any increase in lean muscle will make your body a more efficient fat-burning machine.
- **Fourth**, **supplement** –

** With **Omega 3 fatty acids** to make sure your cells have what they need to support fluidity.*

One supplement that seems to particularly help with the problem of insulin resistance is an Ayurvedic herb called* **Garcinia Cambogia*. It comes from India, where it has been traditionally used as an appetite control, and as an aid in processing food. It is a source of hydroxy-citric acid, or HCA, which appears to work by blocking a key*

cellular pathway that converts glucose to fat. Certainly animals fed an HCA supplemented diet have shown reduced food intake, ***a decline in body fat and lowered triglyceride levels,*** *all highly desirable results in the fight against Syndrome X.*

Consider* ***Alpha Lipoic Acid**. Sid Shastri, CCN of Jarrow Formulas, says: the first line of defense in the war against NIDDM (Non Insulin Dependent Diabetes Mellitus) must be Alpha Lipoic Acid (actually, my personal opinion is that ALA is one of the most important nutrients to promote optimal health generally). There is a great deal of evidence proving that ALA is the closest consumers can get to a bullet-proof vest against diabetes; consider the following:*

* NIDDM humans given a 1000 mg ALA experienced 50% improvement in insulin-stimulated glucose disposal (Arzneimittel-Forschung 1995; 45:872-4)* In animal studies, ALA supplementation prevented diabetes in 70% of the diabetes-induced animals (Int J Immunopharmac 1994;16:61-6)

* In Germany, the first line of defense against diabetic neuropathies (i.e. polyneuropathy, retinopathy) for over 20 years has been ALA,.

* ALA reduces plasma oxidation, whole body oxidation (as measured by urinary isoprostanes) and LDL-oxidation.

Mr. Shastri also recommends* ***Chromium**, saying it is (rightfully) a popular mineral supplement (largest selling mineral supplement after calcium, to the tune of 10 million US consumers) that has widespread applications, including NIDDM. Originally, interest in chromium developed through observations that animals feed chromium-free diets had impaired glucose tolerance. Although there are differences in the forms of chromium available, it is more important to consume the chromium. A recent article in the journal Nutrition Reviews concluded "The metabolic effects of this cheap, natural, and probably safe agent in this large study of type II diabetics were comparable to oral hypoglycemic agents or insulin". Chromium is essential for optimal insulin action, as has been documented in studies done on NIDDM subjects. Dosages used in this study on type II diabetics are 200 to 1000 mcg/day.*

Phaseolomin *– this is a new generation* ***starch blocker protein,*** *which has the capability of attaching to a carbohydrate molecula and preventing it from being split into sugars. This enables the body to rid itself of carbohydrates without absorbing them, reducing both blood sugar levels and insulin requirements.*

Remember, **fats are often replaced in fat-free foods by carbohydrates**, causing the pancreas to produce high amounts of insulin to cope with the high sugar levels. When the fats we need, the poly-unsaturated fats, are not available to our cells, or even worse, are replaced by trans fats, the fluidity of the cell membrane is adversely affected. Insulin cannot bind to the receptor sites on the surface of the cell.

As insulin levels rise and insulin resistance in the body increases. the situation develops its own momentum: the activity of the delta desaturase enzymes which break down essential fatty acids declines, increased amounts of saturated fats become part of our cell membranes, and *insulin sensitivity becomes more extreme*. The enzyme pathways shut down through which Arachidonic acid is converted to the friendly GLA. This in turn means the messengers (eicosanoids) which promote insulin sensitivity in the cells are not sent to do their jobs, more insulin is produced to take care of the added carbs, and the stage is set leading potentially through inflammation to diabetes, cardiovascular problems and cancer. Metabolic Syndrome (Syndrome X) or Insulin Resistance, is set in motion.

Link between Inflammation and Cancer – http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?holding=npg&cmd=Retrieve&db=PubMed&list_uids=12490959&dopt=Abstract

These pathways are needed lead to control inflammation, of particular importance when one looks at the research implicating inflammation generally in poor heart health: Dr. Giles & colleagues (published in *Am J Respir Crit Care Med* 2000;162:1348-1354) examined a study conducted from 1976 to 1992 on 8900 adults, and stated "What we found was that people with an elevated white count were 40% more likely to die from coronary heart disease after taking into account a number of traditional risk factors". **Link between Inflammation and Disease – http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?holding=npg&cmd=Retrieve&db=PubMed&list_uids=12490959&dopt=Abstract**

The study showed that patients with a white blood count over 7.6 were at much higher risk of dying from Coronary Heart Disease, even after adjusting for other risk factors. The new findings support a role for inflammation as a causal factor in the pathogenesis of CHD, the authors say. "We really don't know whether reducing white count will lower the risk," Dr. Giles added in an interview. "That's where we need more studies."

Fatty acid balance determines one's degree of inflammation: if the delta5 desaturase enzymes are turned off by insulin activity, inflammatory cell messengers will be produced, and anti-inflammatory ones in the Omega 3 pathway inhibited.

An added benefit for heart health is that while the Arachidonic acid obtained from animal fats is highly pro-aggregatory (the Linoleic acid contained in such fats is a precursor *only* for Arachidonic acid and subsequently inflammatory PGE2) the good Omega 3 fatty acids such as **Fish Oils** produce PGE1 (Prostaglandin E1), a potent inhibitor of platelet aggregation.

Studies on **Borage Oil's** (high in GLA) use in cases of high cholesterol show an effective dose to be in the 1 to 4 gram range, with improvement in LDL and HDL levels being noted after 2 months. With cardiovascular disease, doses of 4 to 5 grams were shown to reduce blood pressure, and suggest that it may also inhibit some of the processes which lead to plaque forming in blood vessels. A study published

in the *Journal of Hypertension* in 1996 showed that **1 gram of GLA taken for four weeks lowered blood pressure** during stress exposure tests, where a placebo control group evidenced an increase in blood pressure.

Lowering cholesterol is only part of the answer, however. High cholesterol as a cause of heart disease is not convincing to me: more interesting is research suggesting that not HDL alone, but high HDL2 versus HDL3, is protective against heart problems. **Insulin resistance may play a part in suppressing HDL2** (interestingly, beta blockers and thiazide diuretics do too), and HDL3 is converted to HDL2 by exercise, but also by certain supplements, notably **Resveratrol** and **Red Wine Extracts.**

If you are African American, you will be interested in another meta-analysis done by Dr. Chester Fox, associate Professor of clinical family medicine at Buffalo using more than 100 studies. He determined that diets*lacking in magnesium* among young black men and women contribute **not only to high blood pressure, but to insulin resistance**. He also pointed out that serum magnesium tests are not necessarily reliable as a guide to magnesium levels, since much may be circulating, but little may be stored. He suggests adding good sources of magnesium such as avocados, leafy green vegetables and fruits to the diet, but to be careful about supplementation if you have kidney problems.

Insulin Resistance is a dangerous, very dangerous, threat to the balance of health, and needs to be addressed vigorously with diet and exercise.

<u>Metabolic Syndrome Affects 1 in 5 Americans</u>

The metabolic syndrome, affects more than 20% of the US population, according to a report in the February 24th Archives of Internal Medicine.

The metabolic syndrome includes high blood pressure, low HDL cholesterol level, high triglyceride level, high plasma glucose concentration, and obesity, the authors explain; the syndrome is defined by three or more of those conditions. Its prevalence in the US was previously uncertain.

Dr. Steven Heymsfield from the Obesity Research Center of Columbia University in New York and colleagues used data from the Third National Health and Nutrition Examination Survey (NHANES III) to estimate the prevalence of metabolic syndrome in 3305 black, 3477 Mexican American, and 5581 white men and women aged 20 years and older.

Overall, the authors report, 22.8% of men and 22.6% of women satisfied the Third Report of the National Cholesterol Education Program Adult Treatment Panel (ATP III) guidelines for the diagnosis of metabolic syndrome.

The prevalence was higher in Mexican American (20.8%) and white (24.3%) men than in black men (13.9%), the report indicates, and higher in Mexican American women (27.2%) than in black (20.9%) and white (22.9%) women.

The prevalence of metabolic syndrome increased significantly with advancing age, the researchers note.

According to multiple regression models, additional independent risk factors for metabolic syndrome included current smoking, high carbohydrate intake, and physical inactivity in men, as well as current and previous smoking, non-drinking, low household income, and postmenopausal status in women.

“Metabolic syndrome is extremely common, particular in some age, weight, and minority groups,” increasing physical activity “is the most potent lifestyle treatment for metabolic syndrome,” said Dr. Heymsfield. “Metabolic syndrome is most sensitive to treatment in the ‘overweight’ range, so even if you are few pounds overweight you may have great health benefits from small weight loss.” Arch Intern Med 2003;163:427-736,395-397.