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Written by Ann Gerhardt, MD

DEFINING DIABETES RISK

by Ann Gerhardt, MD *Subscribe to DrG'sMediSense newsletter at www.drgsmedisense.com*

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Diabetes mellitus is a disease of high blood sugar, due to inadequate insulin. Either the pancreas can't make any insulin (Type I) or the pancreas can't make enough to keep the blood sugar in the normal range (Type II).

Type I people have lost their pancreatic function due to immune destruction, surgical removal of the pancreas, or destruction of the pancreas by alcohol, chronic pancreatitis or tumor. Type II people burn out the pancreas, usually slowly, over years, from over-use.

People who most easily burn out their pancreas and are at risk for diabetes have what is called ***Metabolic Syndrome.*** This syndrome is characterized by resistance to the action of insulin and leads to bad health outcomes, including heart attacks, kidney failure, stroke, and death. The characteristics of people with metabolic syndrome are listed below.

The normal pancreas makes insulin when blood sugar rises after a meal. Insulin helps the body's tissue to pull sugar out of the blood stream, into the cell for storage. Some of the sugar is stored as glycogen, available for quick energy during physical activity. The rest becomes fat, serving as stored energy for less immediate, sustained energy requirements.

Evolution led to human physiology that allowed survival in feast and famine conditions. Storing calories from a feast allows us to survive during periods of fasting, whether it be days between animal kills or hours between meals. Those who can store energy most-efficiently survived best long ago, but tend to pack on the pounds best now that food is readily available.

Criteria for Metabolic Syndrome

Blood pressure	> 130/80	
Serum triglycerides	> 150 mg/dl	
Fasting glucose	> 110 mg/dl	
	Males	Females
EITHER waist circumference	> 40 inches	> 35 inches
OR waist to hip ratio (divide waist measurement by hip measurement)	> 0.9	> 0.8
HDL-cholesterol	< 40 mg/dl	< 50 mg/dl

Having 3 of these characteristics = metabolic syndrome. With a strong family history, one or two of the above portends a high risk for developing full-blown syndrome.

Humans differ in their ability to make insulin in response to carbohydrate-loaded meal, ranging from normal to none:

- **Normal:** Those who make modest amounts of insulin that are adequate to keep blood sugar levels normal. (These people are also called lucky in today's food-opulent society.)

- **Insulin resistant:** Those who can keep blood sugar levels normal, but do so with lots of insulin. The body's tissues require more than the usual amount of insulin to control blood sugar. Extra insulin pushes the body to make fat out of sugar and tends to block the body's efforts to lose that fat later on.

- **Various degrees of pre-diabetes and diabetes:** Those whose pancreas is working as hard as it can to make insulin, but can't keep the blood sugar in the perfectly normal range. Depending on how out-of-control the sugar is, these are labeled:
  Impaired Glucose Tolerance –two hours after eating the sugar is >120 mg/dl, but the fasting sugar is normal.
  Impaired Fasting Glucose –fasting sugar between 100 – 120 mg/dl.
  Type II Diabetes –Fasting sugar $\geq$ 120 mg/dl, but capable of making insulin.

- **Type I Diabetes** Those who can't make any insulin and absolutely require insulin injections to control blood sugar.

Most "pre-diabetes" people are kidding themselves if they think they can keep doing what they are doing and not suffer consequences. The organ damage that occurs in diabetes actually starts very early in the pancreas-can't-keep-up-with-blood-sugar continuum. People with mildly elevated blood sugars, who don't even have an official diagnosis of diabetes, can develop neuropathy (nerve damage, typically in the feet), kidney damage,

vascular disease (to the legs, heart, kidney and brain) and eye problems (cataracts, retina damage). By the time the doctor makes an official diagnosis, "pre-diabetes" has already inflicted damage on the unsuspecting body.

People who are overweight and out of shape and have a family history of diabetes are at great risk of developing metabolic syndrome. Not all obese people have insulin resistance or metabolic syndrome: They must also have a "diabetes gene" that predisposes them to it. Not all thin people are free from diabetes, particularly if they eat excessive fructose and have a strong genetic predisposition to diabetes. Whether thin or overweight, those who have the genetic make-up to have become insulin resistant and diabetic can stave it off by staying physically fit and controlling diet and weight.