A DOCTOR WITH DIABETES
HOW DIABETES WORKS

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The Diabetic's Bill of Rights

- It is your right, and very possible, to have normal blood sugars.
- It is your right, and very possible, to have normal insulin levels
- It is your right to understand how your body and diabetes work, and how easy it is to take good care of yourself with simple changes
- It is your right to feel more energetic, lose weight more easily with much less hunger and reduce your medications
- It is your right to reduce your risk of developing diabetes and/or reduce the risk of complications from uncontrolled diabetes.

Healthy Hope

- With my own life on the line, when I was diagnosed with diabetes on Feb 11,2004, I decided to find out if there is a way to take care of diabetes that works better than the average way in the US.
- Studying the scientific research , clinical studies and experience of experts, it became clear that it is not hard to return the body to balance with normal blood sugar and normal natural insulin levels.
- It also became clear that it is much better to work at the root cause of problems rather than try to fix each of the outer manifestations

HOPE

- In the following pages I will explain how the body is designed to work, and why and how to return it to balance.
- By returning to normal sugar and insulin levels inside the body, many parts of the body can heal, helping people feel better quickly, and even reversing some of the complications of poorly controlled diabetes
- This approach is not new or unique
- It is natural and simple

What you will learn

- Definition of diabetes and pre-diabetes
- Effects of diabetes
- Who is at risk
- Symptoms
- Causes
- Normal functions of:
  - Sugar: a basic fuel for the body
  - Insulin: a hormone which directs sugar in the body
  - Beta cells: the cells that make insulin

What you will learn

- What insulin resistance is
- Effects of high blood sugar
- Effects of high insulin levels with insulin resistance
- How to prevent and control diabetes YES, YOU CAN!
  - Eating wisely
  - Exercise
  - Attitude affects everything
  - Appropriate use of medicine

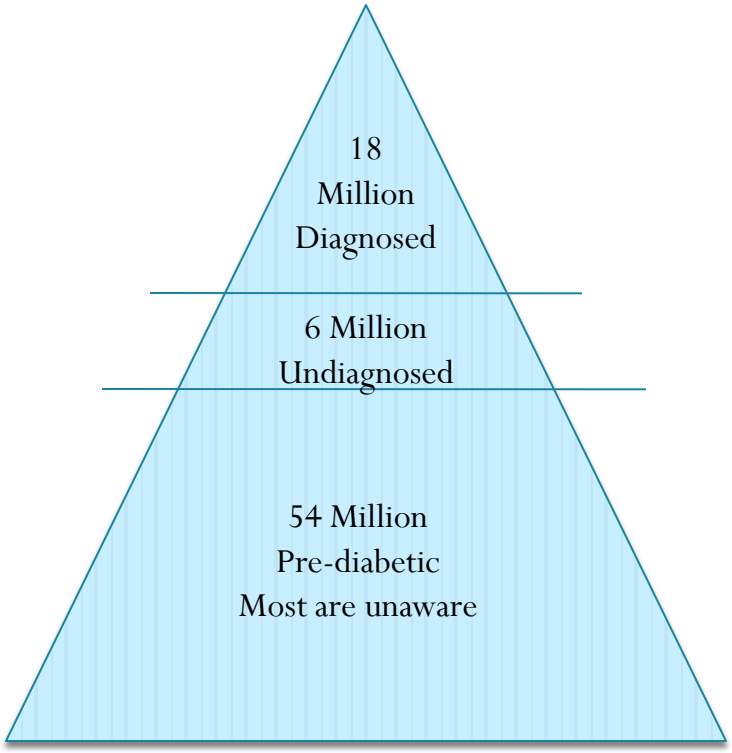
Diabetes = High Blood Sugar

	FASTING 6+ hours water only	**AFTER EATING** Or 2 hour glucose tolerance test
NORMAL	70-100	70-140
PRE-DIABETES	100 – 125	140 - 199
DIABETES	126+	200+

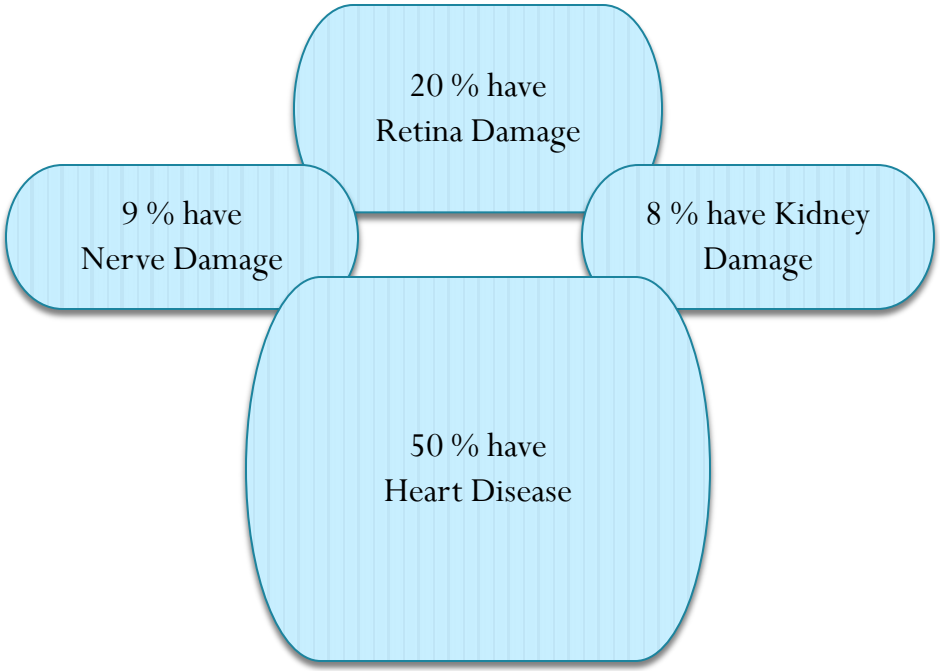
Diabetes = HbA1c 6.5+

Diabetes Care –ADA 2008; 31(1):S55

Diabetes in the USA



AT TIME OF DIAGNOSIS OF TYPE 2 DIABETES



Adapted from the NIH 2007
National Diabetes Statistics

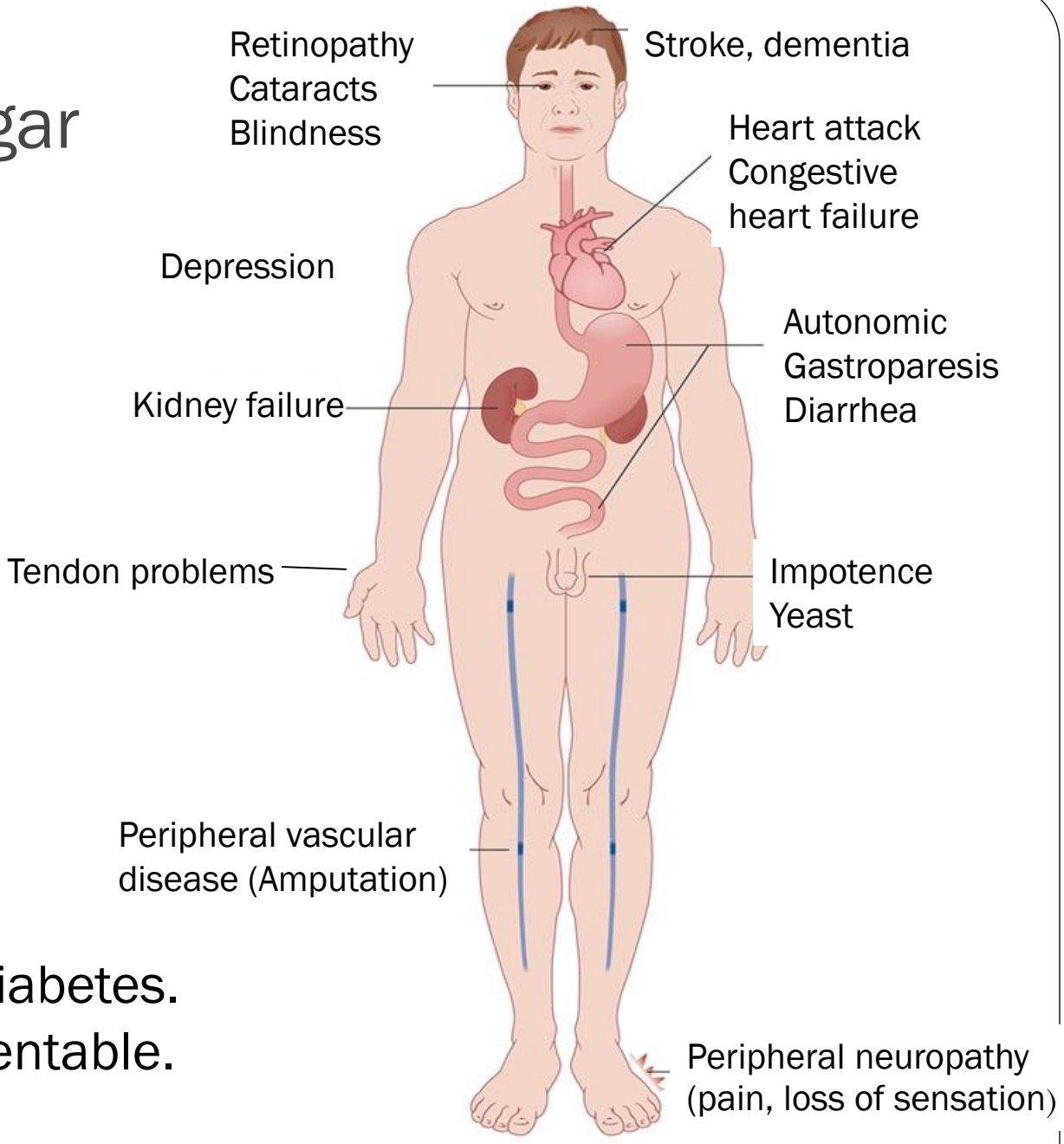
Statistics Are People With The Tears Wiped Off

In the USA:

- Diabetics die an average of 15 years earlier than their peers, usually after years of complications. Average means some do better, some worse.
- The rate of diabetes has almost doubled in the last 10 years
- Diabetes medical costs and lost productivity

  totaled 174 billion dollars in 2007

High Blood Sugar Kills People Bit By Bit



From Uncontrolled Diabetes.
All of these are preventable.
Some are reversible

High Blood Sugar Can Kill People Fast

- 85% of diabetics die of heart attack or stroke
- In diabetes, pre-diabetes or undiagnosed diabetes
  - Higher rates of death and complications:

    during any hospital admission, after surgery, after a heart attack, pneumonia
  - Highest death rate if undiagnosed before admission
  - Tight control (sugar always less than 140) ↓ deaths and complications
  - But low blood sugars are dangerous, too

Khaw et al, Annals Int Med 2004; 141:413-21
VandenBerghe et al, NEJM 2001;345:1359-1367
McAlister et al, Diabetes Care 2005;28:2108-2115
Kornum et al, Diabetes Care 2007;30:2251-2257

High Blood Sugar Can Kill People Fast

- Diabetes in Pregnancy
  - Mother: pre-eclampsia, seizure, stroke, liver, internal bleeding
  - Fetus: miscarriage, malformations, unexplained death in 9th month
  - Infant: malformations, brain injury due to low blood sugar or difficult birth (too big)

Types of Diabetes

- Type 1: 5-10% of diabetes
  - Caused by virus, antibodies, and/or heredity
  - All Beta cells have died so cannot make insulin
  - Must inject insulin to survive
- Type 2: 90-95% of diabetes
  - 50-80% of the Beta cells have died due to overuse and toxic effects
  - Has insulin resistance: body needs higher than normal levels of insulin to lower blood sugar
  - Used to be called "Adult Onset" but more and more common in children and teens

WHAT CAUSES TYPE 2 DIABETES?

HOW WE EAT AND LIVE!

- Twice as many new cases of Type 2 Diabetes diagnosed each year now compared to 10 years ago
- Our genes haven't changed that fast, so it's not just the genes you got from your parents
- How we live, eat and drink affects what genes are activated!
- Amount of sugar adults get from soda, fruit drinks, alcohol, sport drinks, juice, etc quadrupled from 1965 to 2002.*
- 12 ounces of soda (1 can) = 10+ teaspoons of sugar
- 12 ounces of 100% orange juice = 9+ teaspoons sugar

* "Shifts in patterns and consumption of beverages between 1965 and 2002" Duffey K, Popkin B, Obesity 2007

WHO IS AT RISK FOR DIABETES?

- Family members have diabetes
- People who eat and drink junk
- Waist more than 35″ women, or 40 ″ men
- Polycystic ovaries: irregular periods, maybe facial hair
- Pregnancy:
  - Gestational diabetes
  - high blood pressure, high sugar, or baby over 9#
- Low blood sugar
- Many skin tags, or Acanthosis nigricans

Acanthosis Nigricans

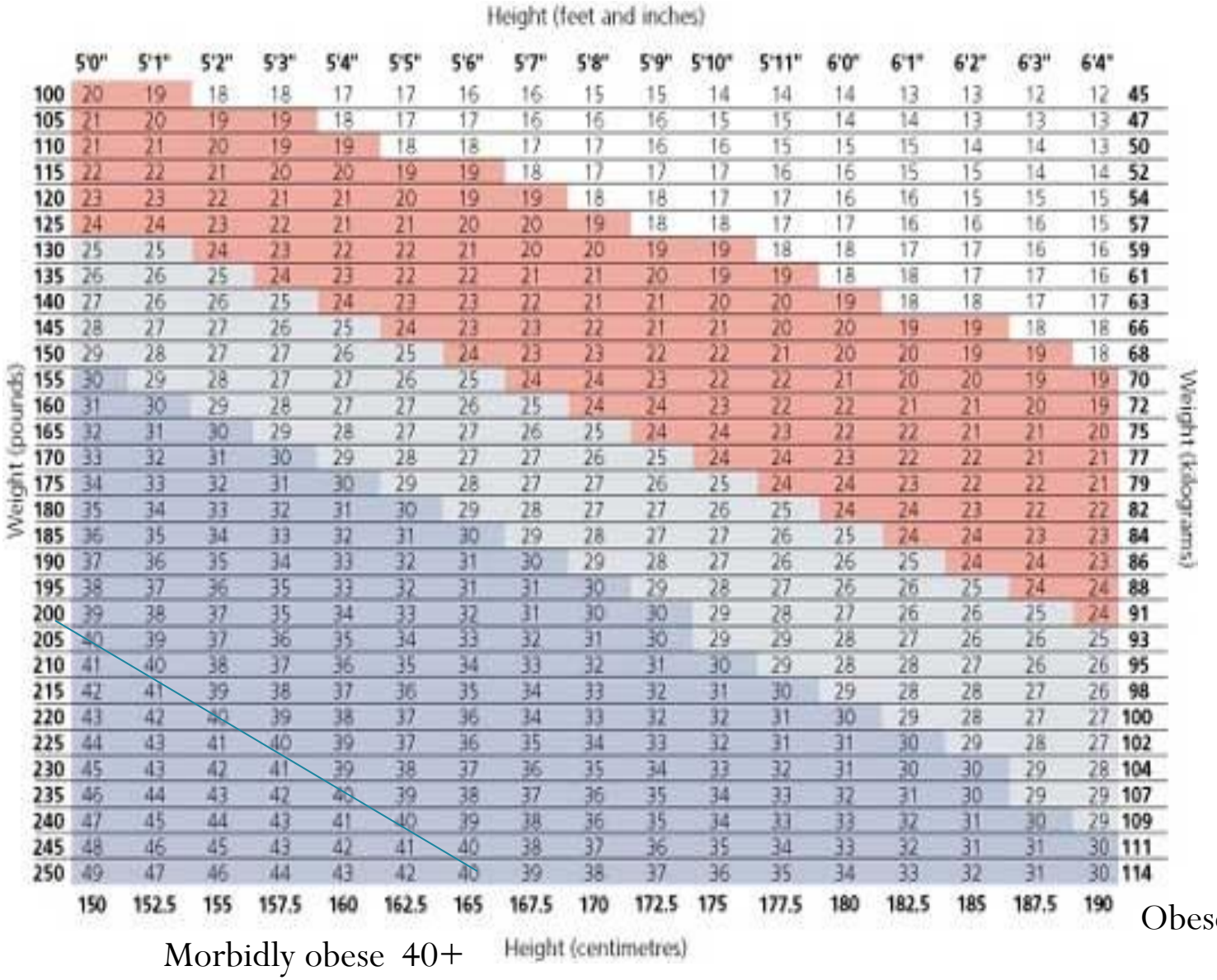
Skin tags and acanthosis nigricans mean that the skin has been exposed to abnormally high levels of natural insulin for a long time

WHO IS AT RISK FOR DIABETES?

- High triglycerides: after food 300+ , or fasting 150+, or on medicine for cholesterol
- High blood pressure: over 140/90, or on medicine for blood pressure
- Fatty liver
- High uric acid
- BMI 30+ (2 chins), normal is 20-25

BMI Scale

(Developed by life inurance and health insurance companies from health and death statistics. People with normal BMI of 20-24 are healthier and live longer)



Thin
<20

Normal
20-24

Overweight
25-29

Obese 30 +

Morbidly obese 40+

SYMPTOMS OF DIABETES

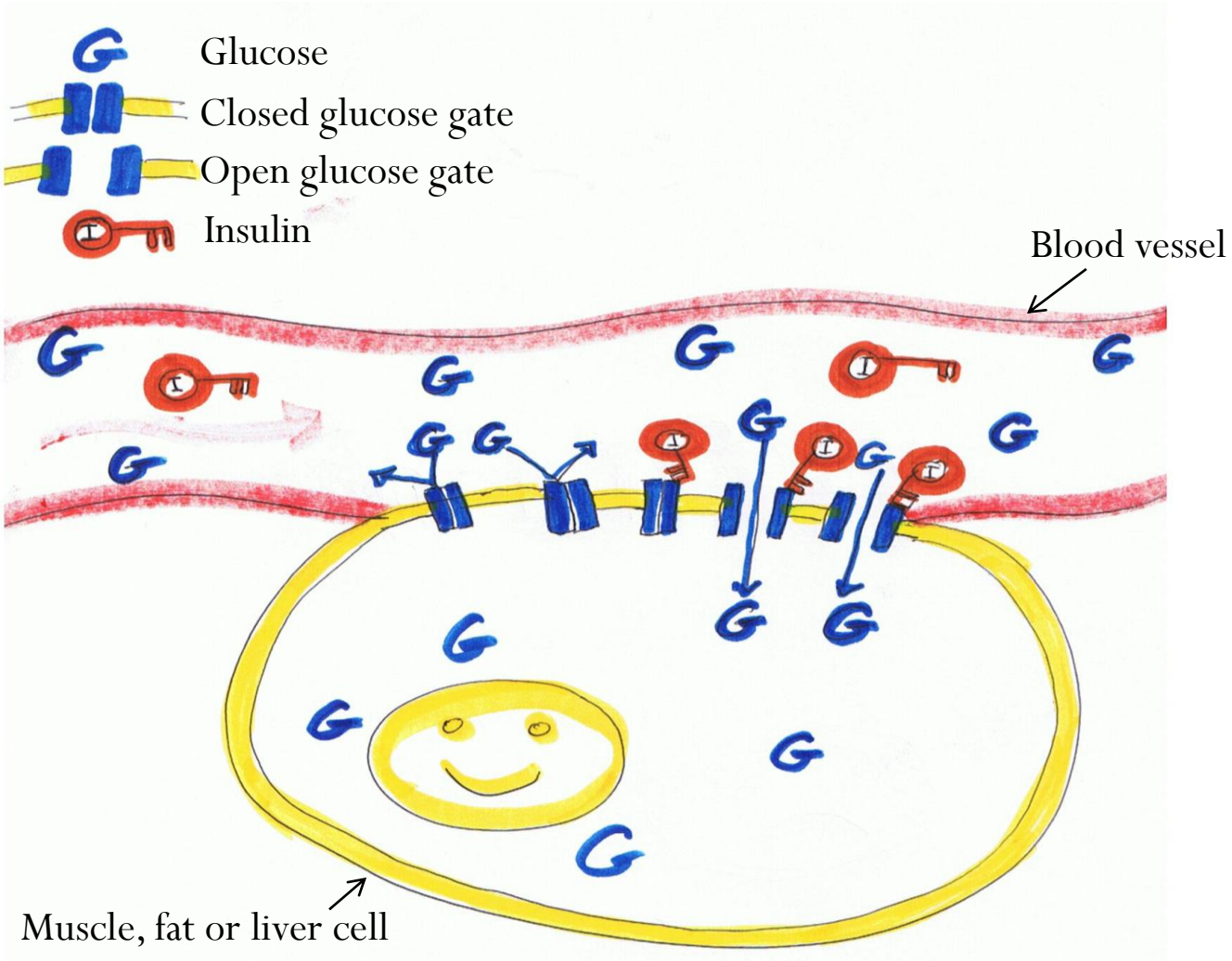
- Tired
- Urinating 2 or 3 times at night
- Yeast infections
- Vision – good and bad days
- Thirsty often
- "Just getting old"
- Recurrent infections
- Impotence
- Heart Attack (a bad first sign of diabetes)

INSULIN

- Amazing hormone made in Beta cells in pancreas
- Tells cells what to do with sugar
  - opens the glucose gate into cells
  - used by muscle, liver and fat cells
  - not needed for glucose to enter brain, nerves, blood vessels, kidneys
- Lowers blood sugar
- Stores fat, controls use of stored fat
- Affects growth, DNA
- Affects blood pressure, cholesterol and triglycerides

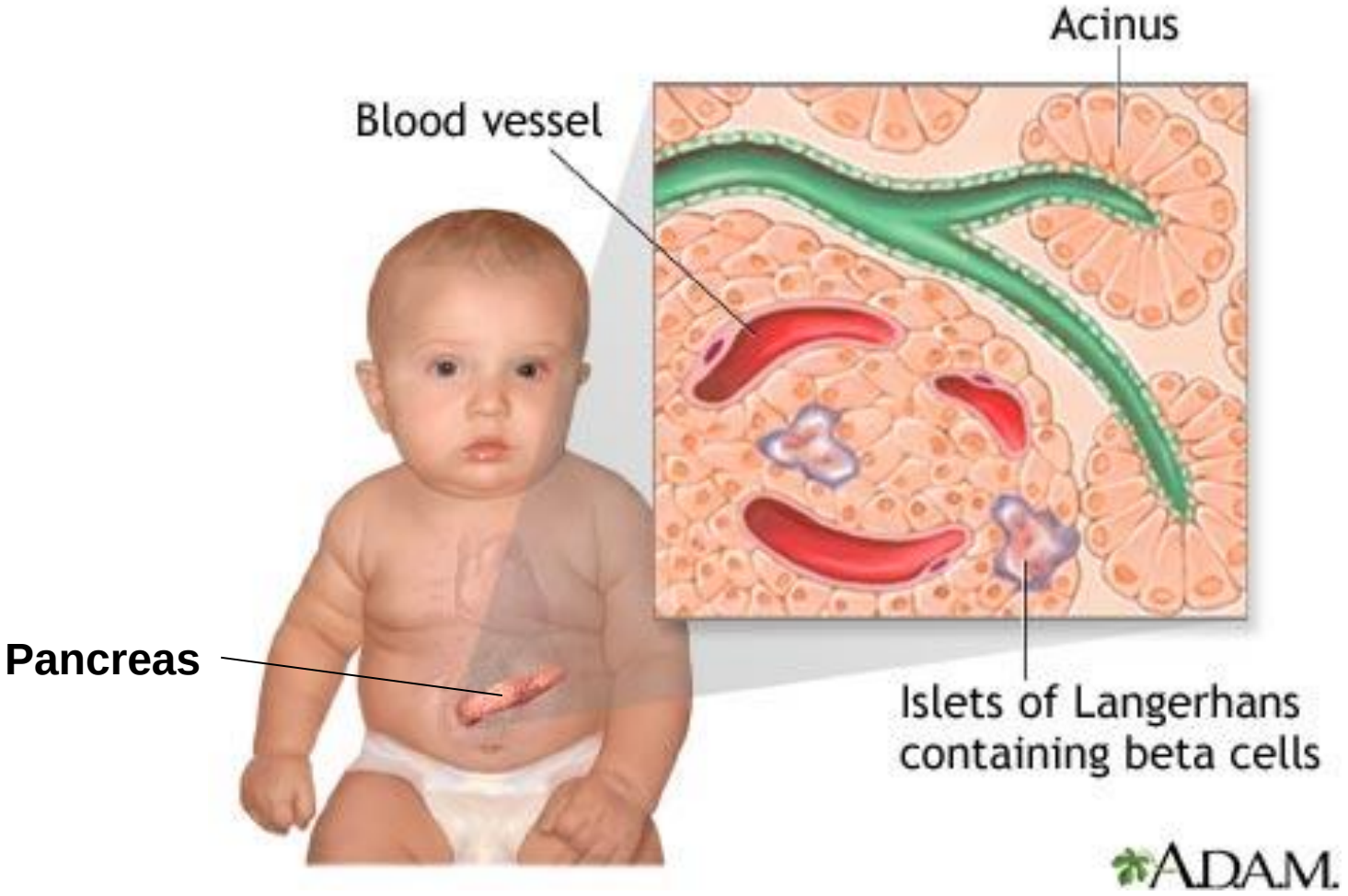
NORMAL INSULIN WORKING

Insulin is the key that opens the glucose gate to allow blood glucose (fuel) into the cell. It is required in muscle, liver and fat cells.

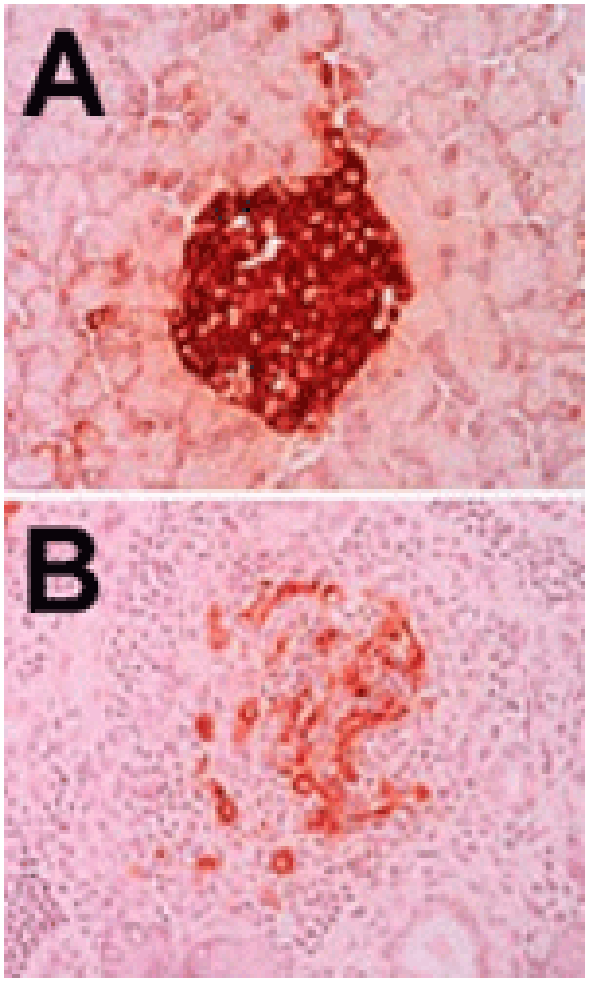


BETA CELLS – make insulin

WE ARE BORN WITH A LIFETIME SUPPLY



BETA CELLS



Normal

Diabetic

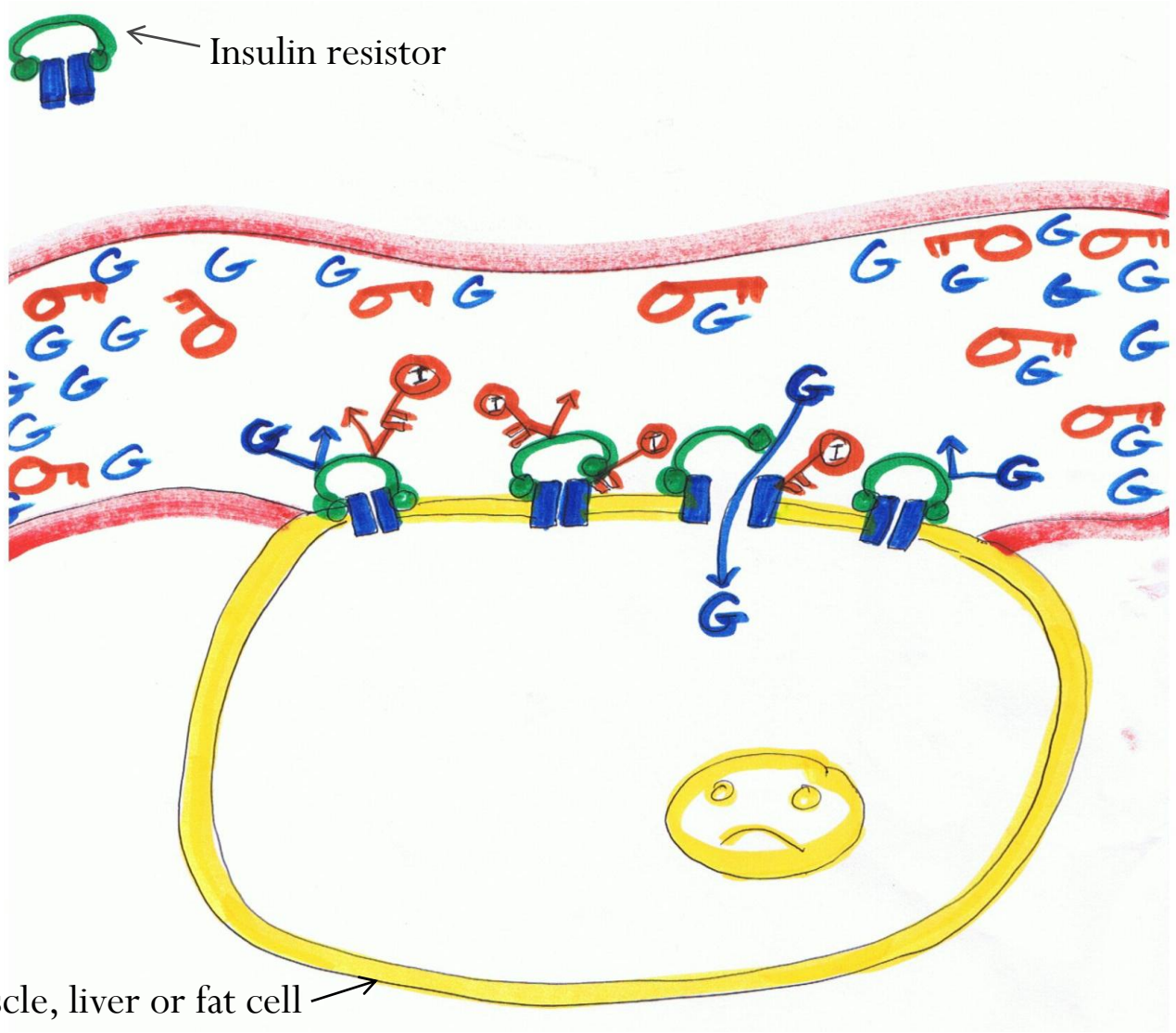
- Beta cells make <u>insulin</u> and <u>amylin</u>
- Beta cells only live in the pancreas
- Only 1% of all cells in the pancreas are beta cells
- 50-80% of beta cells are dead by the time diabetes is diagnosed
- We cannot make new beta cells
- Amylin helps control appetite in the brain and stomach
- If most of your beta cells are dead it is hard to control your blood sugar <u>or</u> your appetite

INSULIN RESISTANCE

- Definition
  - "Normal amounts of insulin are inadequate to produce a normal insulin response in muscle, fat and liver cells"
  - The cells are resistant to the action of insulin
  - It takes higher than normal levels of insulin to allow glucose to move from the blood stream to inside the cell
  - The Beta cells have to make more insulin than normal to overcome the insulin resistance

INSULIN RESISTANCE

Insulin resistance results in less fuel getting into the hungry cell, and high levels of glucose and insulin in the bloodstream



INSULIN RESISTANCE
Long Term Causes

- Overweight
- Inflammation
- Hereditary tendency
- Lifestyle affects what genes are expressed
- Adolescence
- Pregnancy
- High blood sugar
- High insulin levels

INSULIN RESISTANCE
Immediate Causes

- High blood sugar
- High insulin levels
- Adrenaline
- Infection
- Dehydration

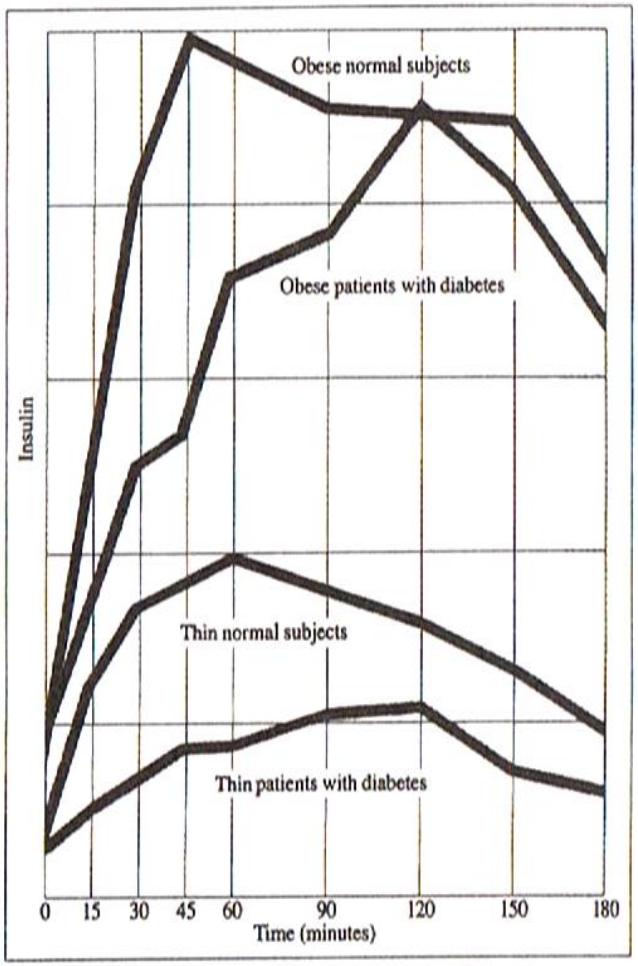
- Exercise **reduces** insulin resistance immediately **and** long term

HOW TO REDUCE INSULIN RESISTANCE

- Keep blood sugar normal
- Keep insulin levels normal
- Exercise
- Increase muscle mass
- Don't eat carbohydrates
- Lose weight (natural result of first five)
- Drink enough water
- Get enough sleep (treat sleep apnea)
- Metformin, rosiglitazone (Avandia), pioglitazone (Actos)

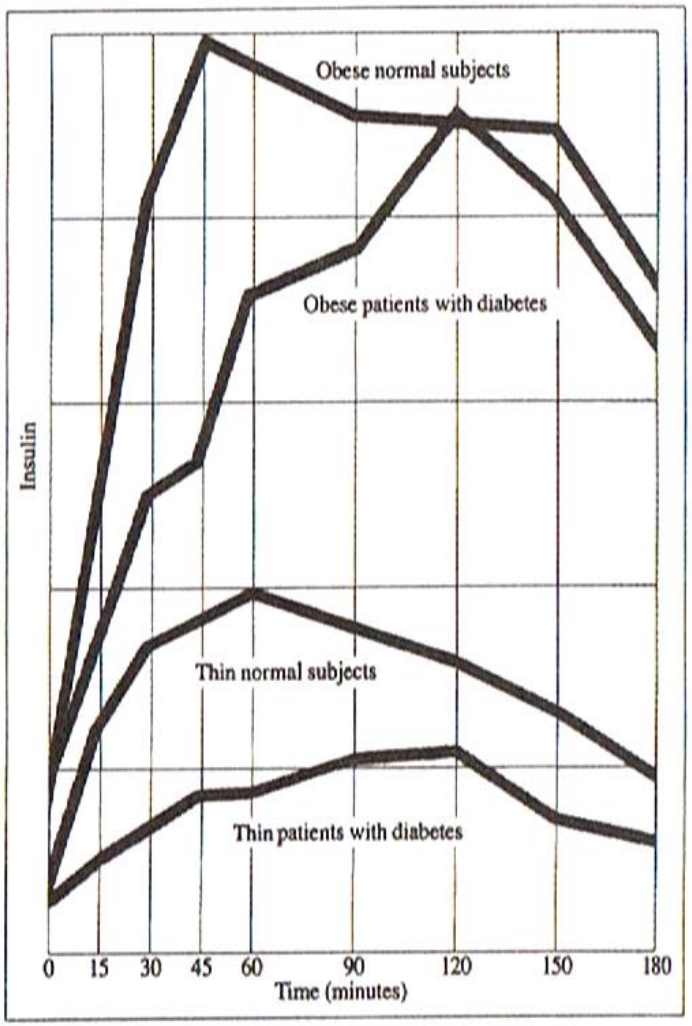
Natural insulin response to eating carbs (sugars and starches)

This is INSULIN level, not sugar



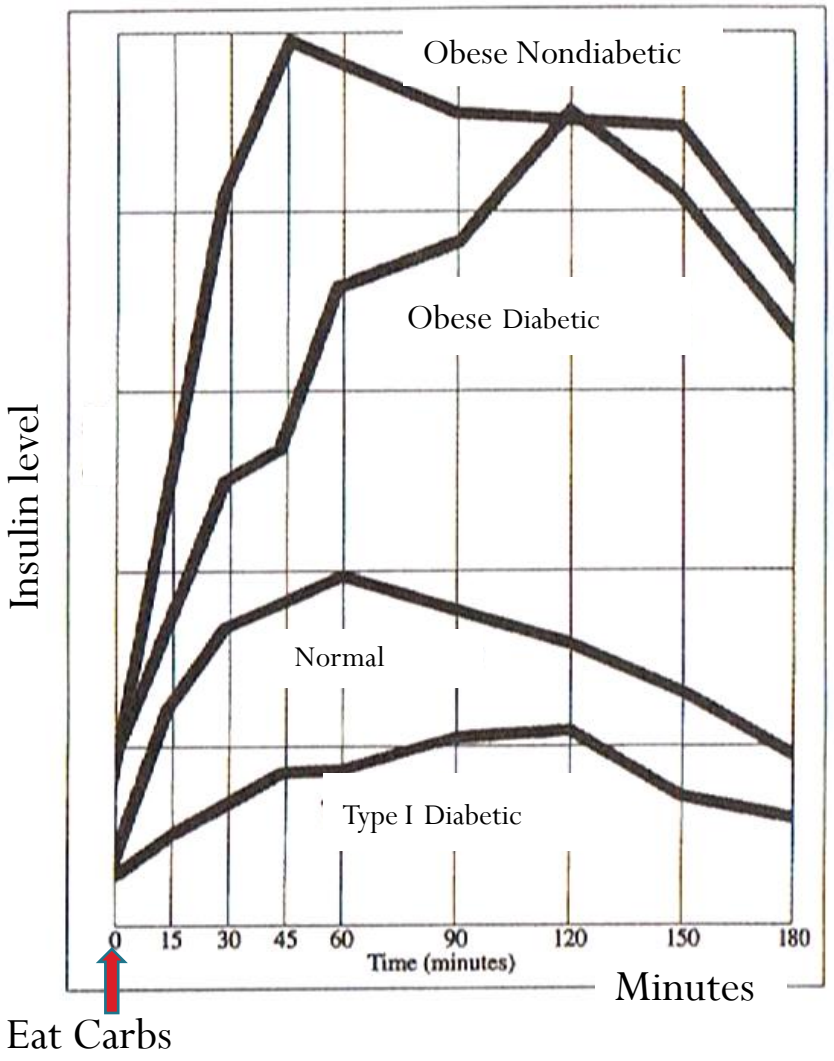
- This graph shows the naturally occurring levels of insulin in the blood in response to eating one cup of oatmeal and 8 ounces of orange juice. The 4 curves are from 4 different types of people.
- Each person eats the same amount of carbohydrate (sugars and starch).
- 1-The Normal, healthy insulin levels are in the second curve from the bottom: a non-diabetic at normal weight. We all start out at a low level of insulin. As soon as we eat, the mouth, stomach and blood send a message to the beta cells to send out insulin. Normally the insulin production peaks at about 1 hour, then it declines, reaching baseline again after 3-4 hours.
- 2-The bottom curve is from a Type 1 diabetic (or advanced Type 2). Too many beta cells have died, so it's impossible to make normal amounts of insulin.

Natural insulin response to eating carbs



- 3-The top curve is from an Obese Non-diabetic person. Obesity is a major cause of insulin resistance, which means the body is resistant to its own insulin and to injected insulin. In insulin resistance it takes higher levels of insulin to lower the blood sugar by the same amount.
- An obese person will make up to 4 times as much insulin as a normal weight person to keep the blood sugar normal following the same meal. And they keep making high levels of insulin for hours after the normal person. But every morning they get a fresh start with near normal levels of insulin.
- 4-The second curve from the top is from an Obese Diabetic. They can no longer make the insulin peak as quickly, but their poor, tired beta cells rally to the sugar cause and still make very large amounts of insulin for many hours.

How High Insulin Levels With Insulin Resistance Damage Your Body



Graph from Dr. Bernstein's Diabetes Solution, 2007

- Insulin is THE fat storing hormone
- Prevents use of stored fat
- Causes low blood sugar (hunger)
- Making too much insulin burns out beta cells

- ↑Blood pressure
- ↑Triglycerides
- ↑Total and LDL Cholesterol
- ↓HDL
- ↑Inflammation
- ↑Free radicals
- ↑Oxidants
- ↑Clots

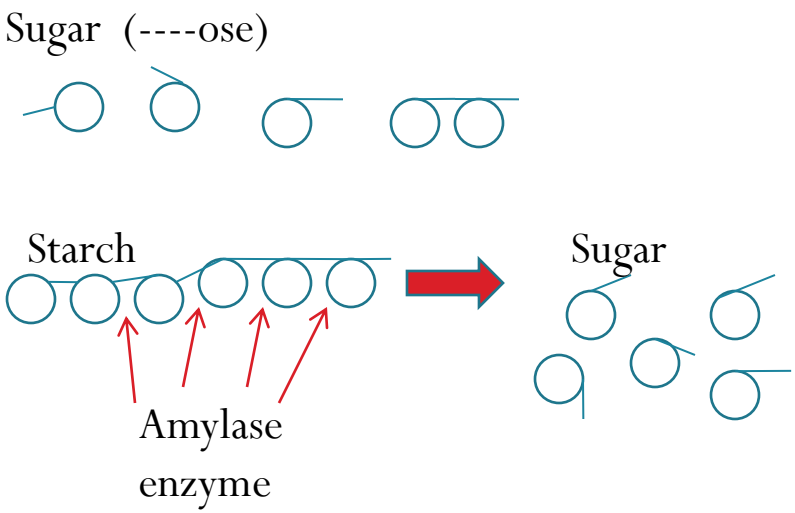
Leads to HEART ATTACK, STROKE

Take care of your old, tired Beta cells. Don't make them work hard anymore!

An old horse can help around the farm for years, as long as he is not required to do heavy labor. Hitch him up to plow a field of clay and he will die in the field, working his heart out for the farmer. Like tired old Beta cells required to plow thru a plate of mashed potatoes.

Carbohydrates = Sugars and Starch

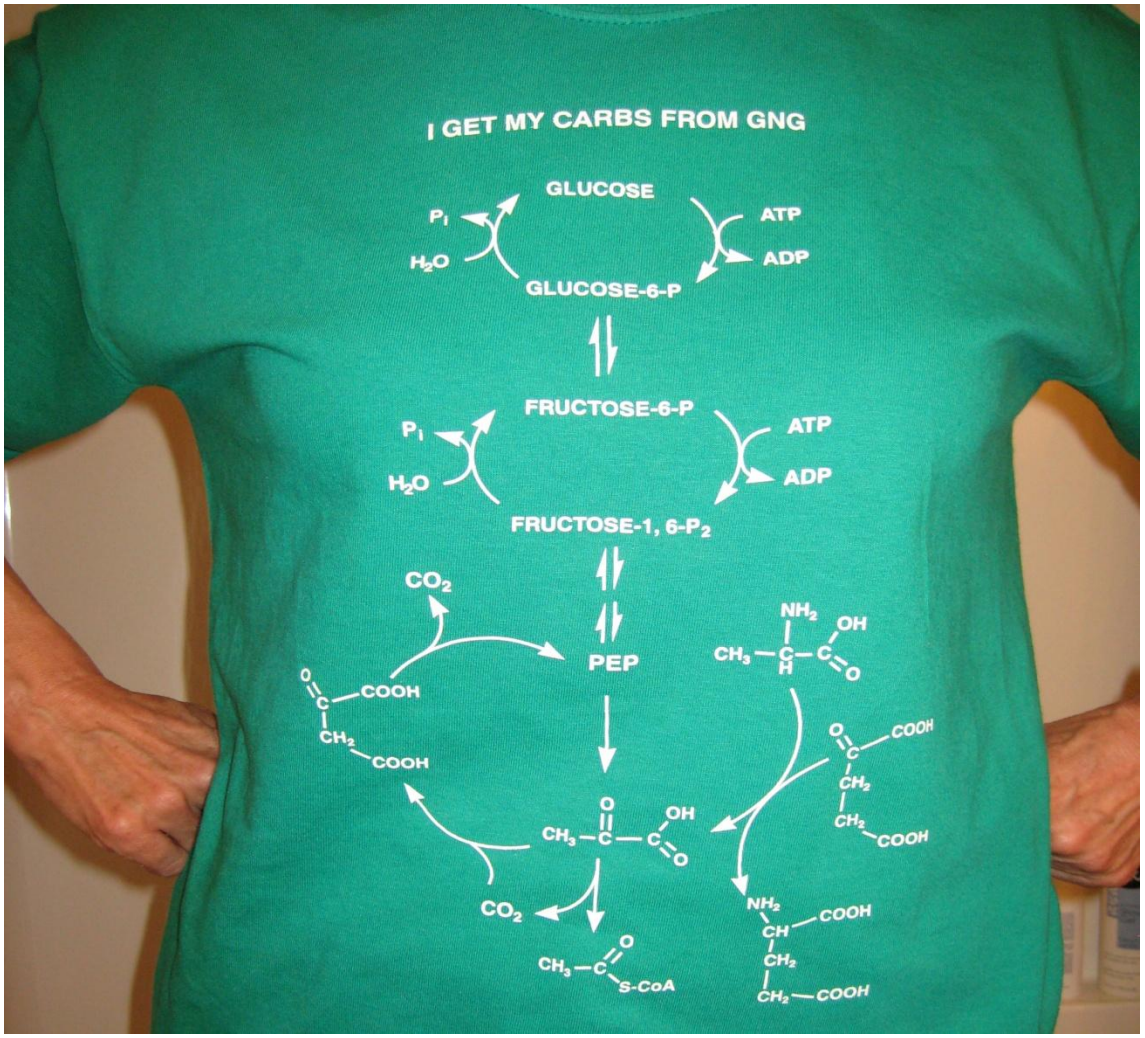
- Sugars
  - One of the basic fuels
  - Made from sugars, starch, protein
  - Glucose, sucrose, fructose, lactose, maltose, etc
- Starch
  - Chains of sugar
  - Cut into sugar by amylase in minutes
  - Amylase is in our saliva and intestines
  - Starch = sugar to your body



Carbohydrates

- Carbohydrates (sugars and starches) that we eat are digested into sugar and absorbed from the mouth, stomach and intestines into the blood.
- The blood carries the blood sugar to the cells where it is used as fuel (energy) to run the cells.
- Insulin, with fine tuning from other hormones, controls the level of sugar in the blood and in many types of cells
- Carbohydrates are not a necessary nutrient
  - We can make glucose from protein, fat and pyruvate (from other body processes)
  - We can use fat as fuel for the body

I Get My Carbs From GNG (Gluco-Neo-Genesis)



This T-shirt shows the many chemical pathways the body uses to make blood glucose out of non-carbohydrates.
We do not have to eat carbohydrates to make blood glucose.

2 Ways High Blood Sugar Damages the Body

Glycosylation: means "sugar-ification"

The small, reactive glucose molecule sticks permanently to larger molecules

Crosslinking: Large molecules are permanently linked to other large molecules by sugar molecules

(Poison: a chemical that damages structure or function of molecules or cells within the body)

How High Blood Sugar Damages the Body

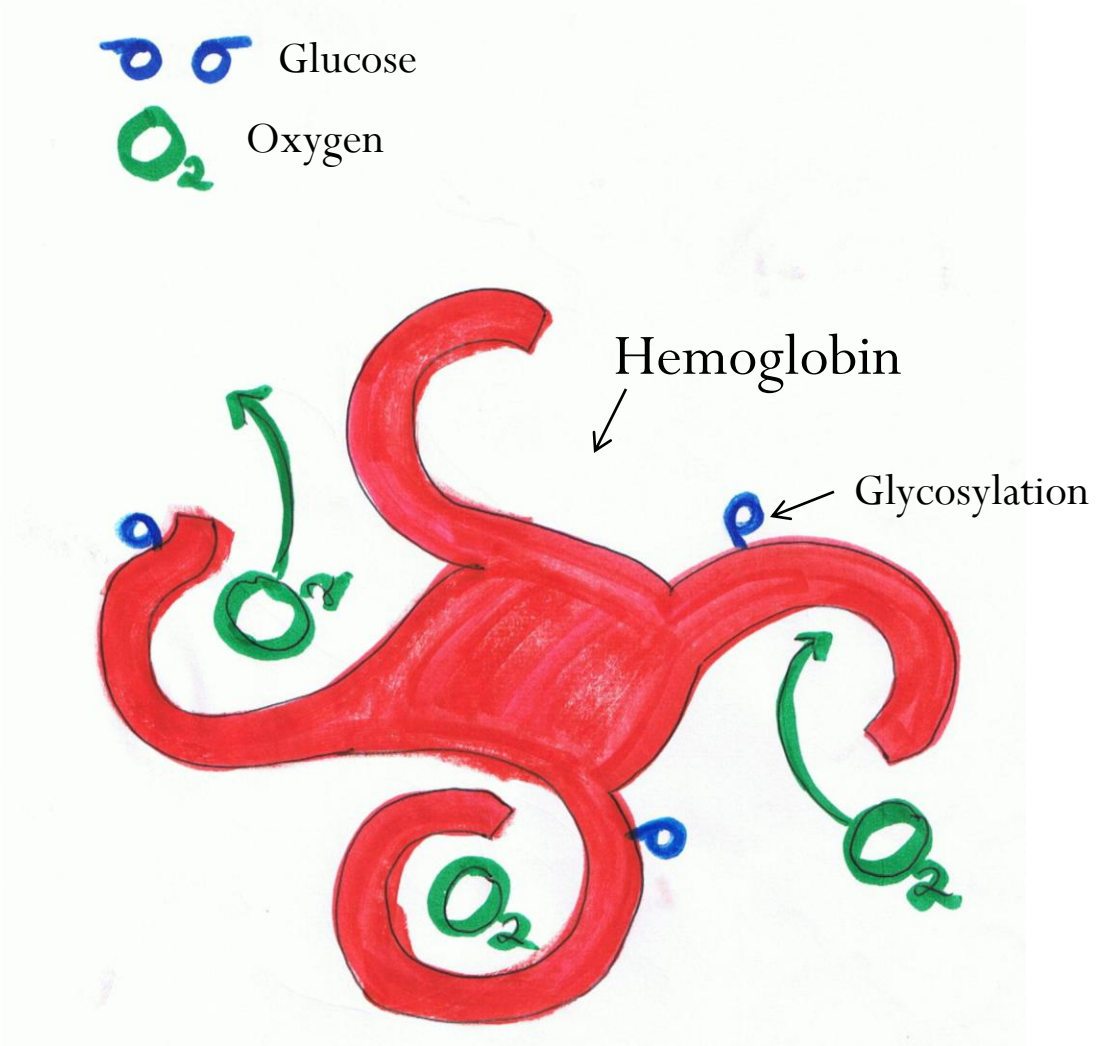
Glycosylation: Sugar permanently sticking onto other molecules

Affects:

- Proteins
  - The little machine molecules that run everything in the body
  - Enzymes
  - Messaging inside the cell
- Lipids and fats
  - which make up every cell membrane
- DNA
  - Affects what genes are expressed
  - May explain higher rates of cancer in poorly controlled diabetics
- RNA
  - the machinery that translates DNA into living human beings

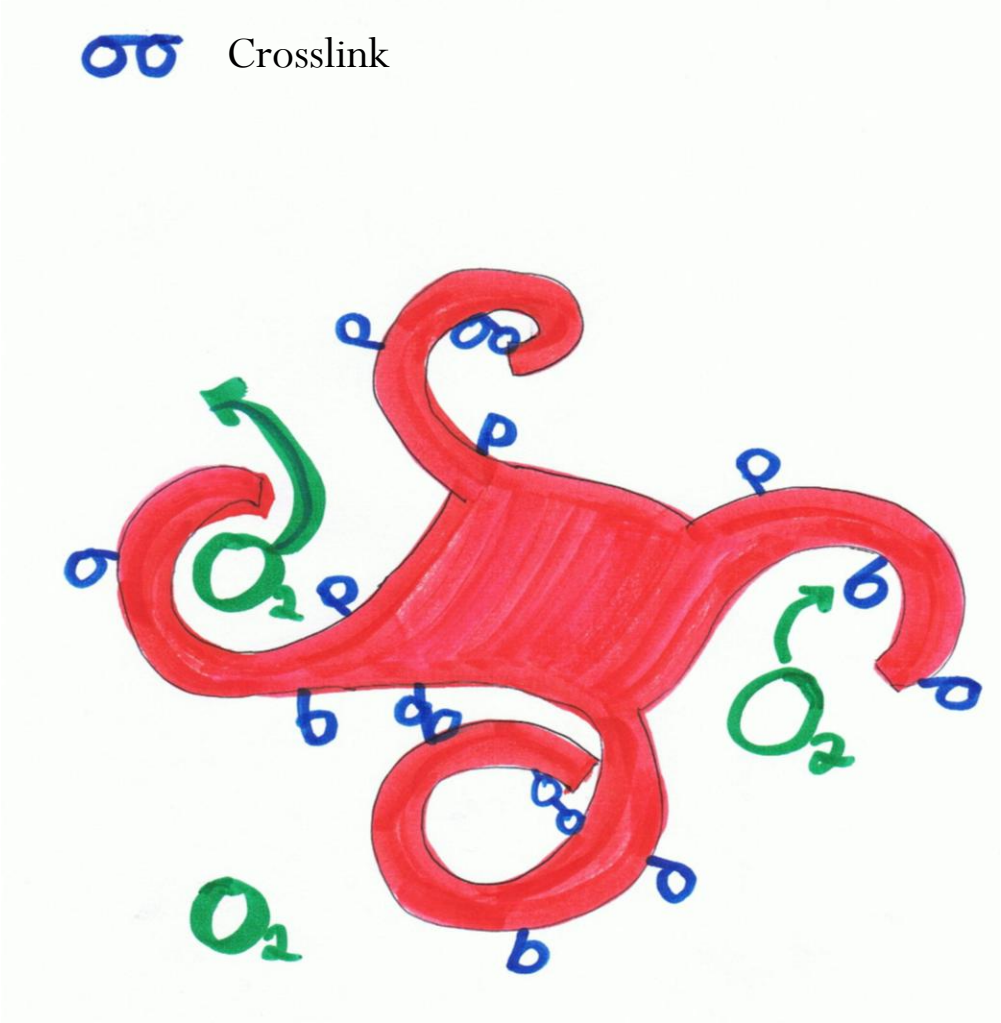
Hemoglobin A1C (HbA1C) is Glycosylated Hemoglobin

- Hemoglobin is the oxygen carrying molecule (little machine) in blood
- The hemoglobin arm wraps around the oxygen to carry it, then releases it where it is needed
- Normal HbA1C is 3.5-5.0 (there is always a little sugar stuck onto hemoglobin molecules)



High Hemoglobin A1C Diabetes=6.5+

- High HbA1C is from high blood sugars
- HbA1C reflects average blood glucose over the last 2-3 months
- HbA1C represents the glycosylation level of <u>all</u> proteins in the body
- Proteins cannot work right if they are stuck together with sugar



Chicken

Fresh

Glycosylated

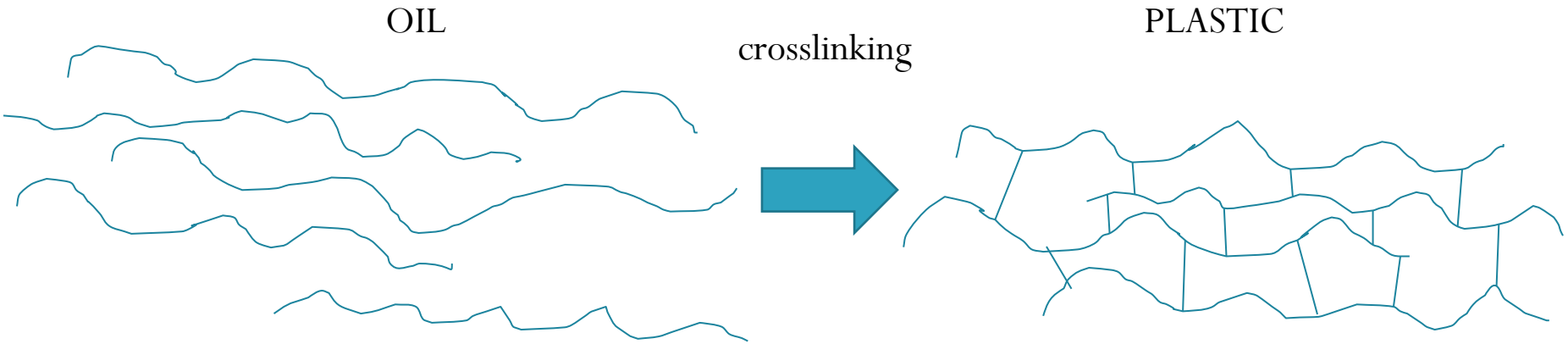
Glycosylation was first recognized as the process which gives roasted meat its brown color and texture.

I would rather not be glycosylated, myself.

How High Blood Sugar Damages The Body

Crosslinking: Permanently sticking molecules together with sugar

- Occurs when blood sugar is more than 160
- Affects the function of the molecules, they cannot move or work normally because they are all stuck together
- Crosslinking is how oil is turned into plastic
- They have extracted a gooey brown plastic from the legs of poorly controlled diabetics (crosslinked proteins). It fluoresces yellow.



Plastic is useful because it sits there and doesn't change or interact with anything, not a good thing in a living body.

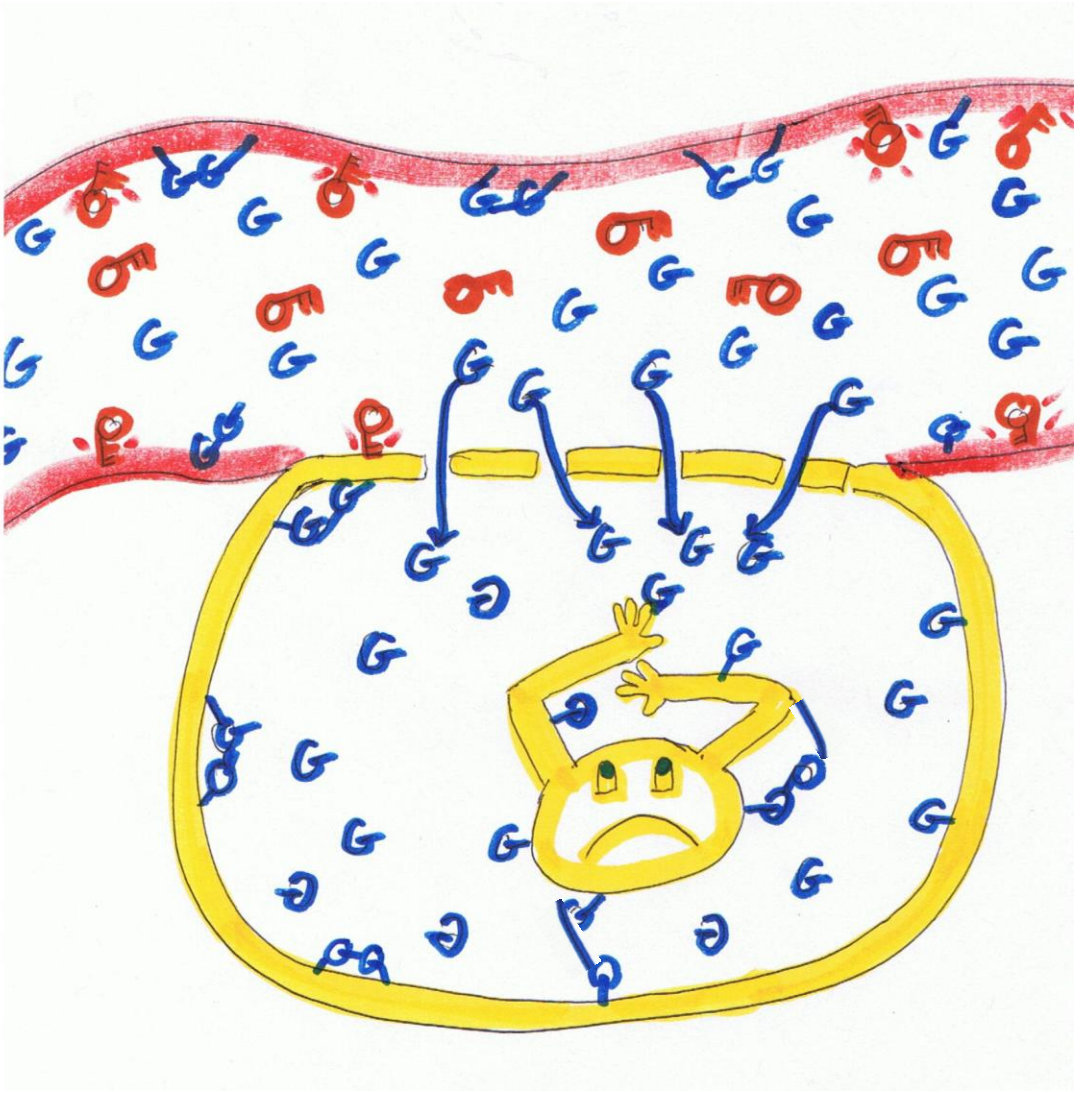
Cells With High Sugar Levels

Glucose

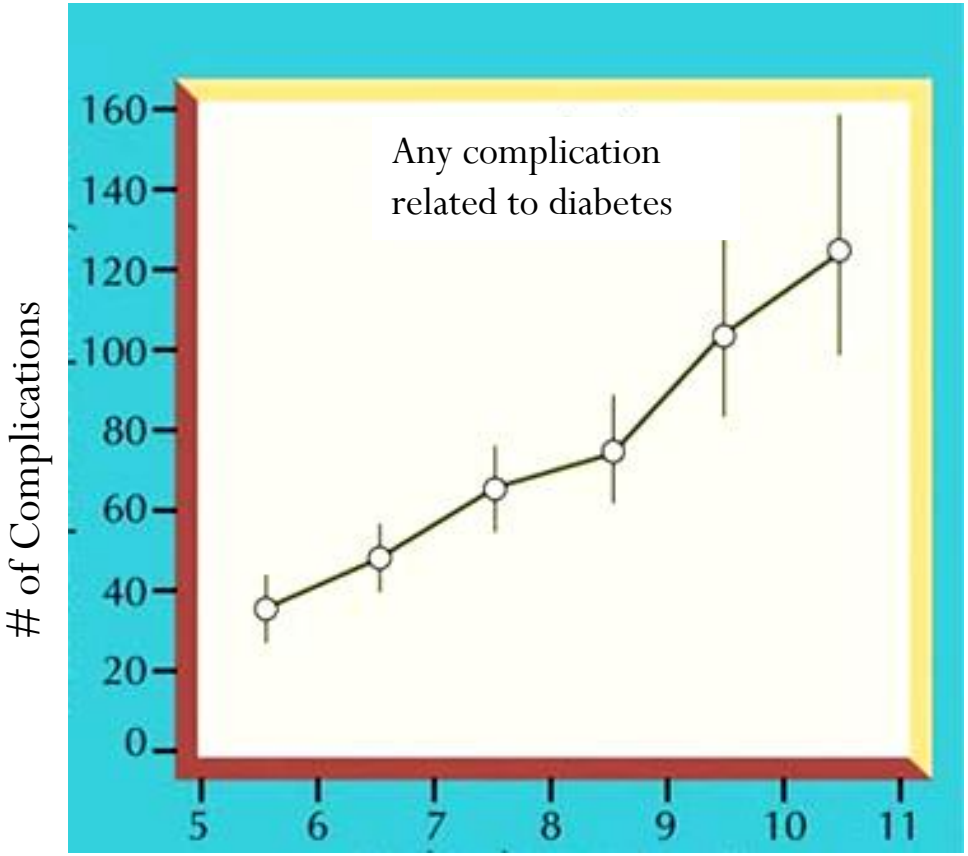
Glucose Crosslink

Excess Insulin Damage

Glycosylation and crosslinking are bad for all parts of the body



Many studies show that the risk of complications depends on the HbA1C

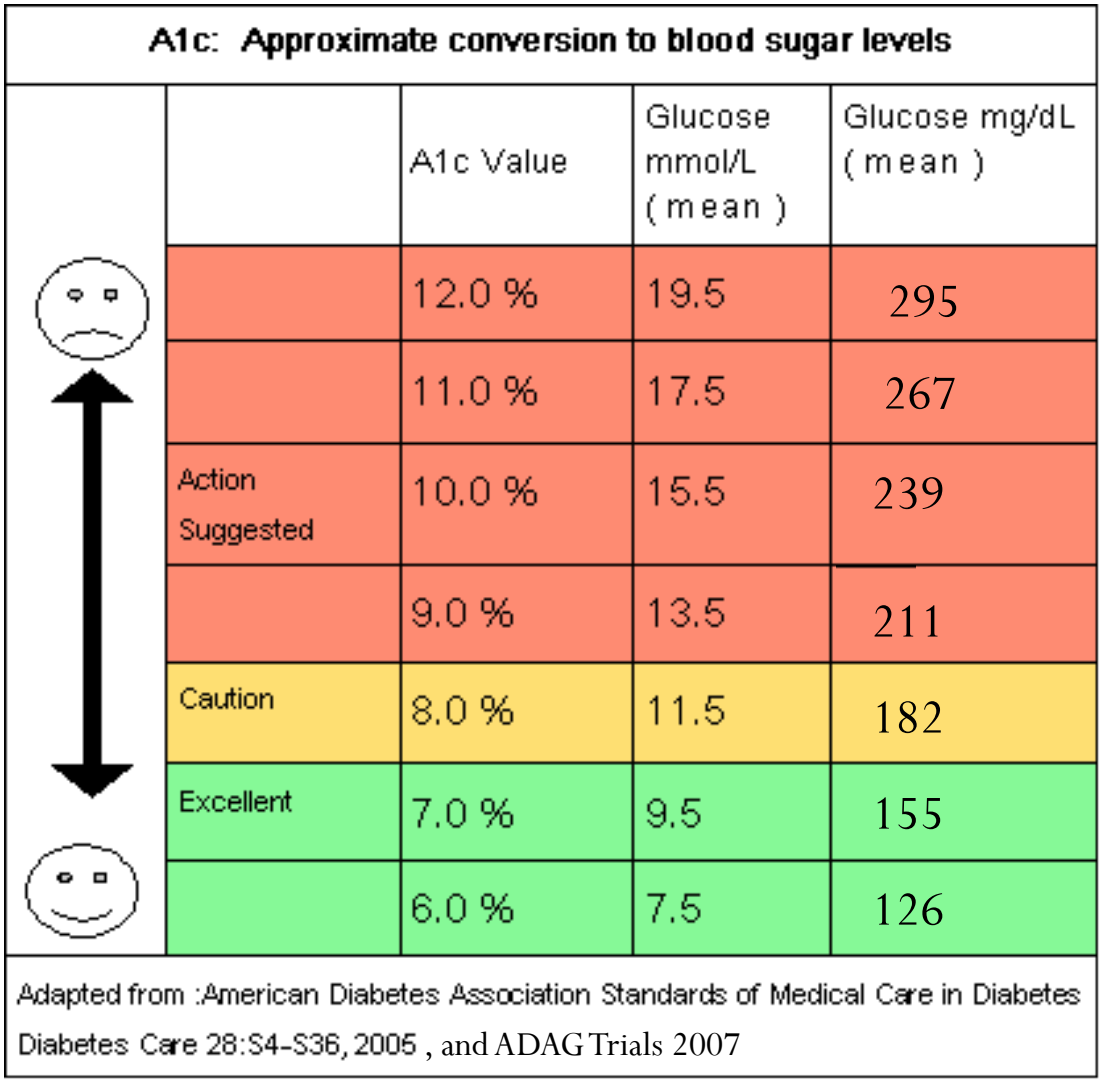


- COMPLICATIONS
  - Heart attack
  - Kidney disease
  - Cataracts
  - Stroke
  - Retina disease
  - Peripheral artery disease
  - Amputations

- Notice that the risk of complications continues to decrease at HbA1c below 7

Stratton et al, BMJ 2000;321:405-412
UKPDS 33, Lancet 1998;352:837-853

ADA Standards of Care: a Compromise



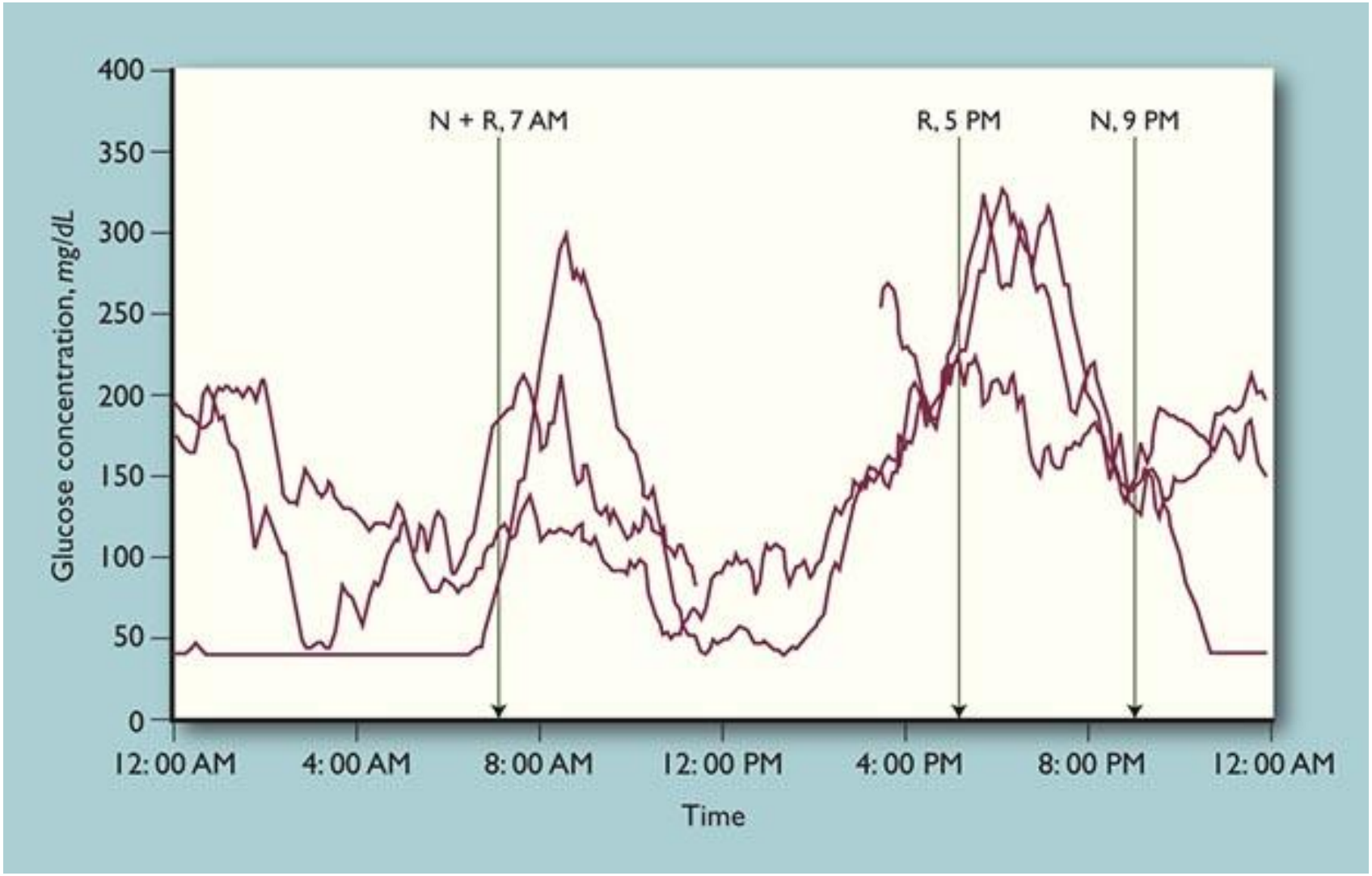
A1c: Approximate conversion to blood sugar levels			
	A1c Value	Glucose mmol/L (mean)	Glucose mg/dL (mean)
	12.0 %	19.5	295
	11.0 %	17.5	267
Action Suggested	10.0 %	15.5	239
	9.0 %	13.5	211
Caution	8.0 %	11.5	182
Excellent	7.0 %	9.5	155
	6.0 %	7.5	126

Adapted from :American Diabetes Association Standards of Medical Care in Diabetes Diabetes Care 28:S4-S36, 2005 , and ADAG Trials 2007

Why are we asked to settle for a HbA1C of 6.5-7.0 if lower is better?

- The concern is low blood sugar, which is dangerous
  - The ADA and the AACE know that the current recommendations are a compromise, to avoid the danger of low blood sugar from very tight control of diabetes.
  - Low blood sugar can cause accidents, brain damage, heart attacks and death
  - Medicine cannot imitate the beautiful, fine balancing of sugar and insulin which a healthy pancreas can do
  - So using extra medicine to provide extra insulin to cover carbohydrates often results in high **and** low blood sugars

Continuous glucose monitor tracing of a 16-year-old diabetic girl with HbA_{1c} of 7.3%. Guess when she ate carbs. When she overshoots with insulin she is below 50 sometimes …Dangerous.



How Do I Avoid High and Low Blood Sugar At The Same Time

- It is difficult to have tight control of blood sugar if you eat carbs:
  - It is impossible to know the exact carbohydrate content of a food, and therefore how much medicine or insulin you will need for it.
    - Food labeling can legally be off by 20% less or more than stated
    - How much sugar and starch a fruit has depends on size and ripeness
  - How fast sugar will be released into the blood from the stomach and intestines is unpredictable. It depends on what else was eaten, time of day, state of health and activity.
  - You can safely avoid low blood sugar from too much medicine, and avoid high blood sugar from too much sugar or starch, if you avoid carbohydrates.
  - When you start eating lower amounts of carbs,
    YOU MUST REDUCE YOUR DIABETES MEDICINE DOSES,
    talk to your doctor.

How Do We Prevent Diabetes Damage?

- Goals
  - Keep sugar levels normal, not high or low
  - Keep insulin levels normal, not high or low
  - Reduce insulin resistance
  - Preserve your Beta cells
  - Keep blood pressure, cholesterol and triglycerides normal

- Solution: Eat Low Carbohydrate and Exercise
  - Medicines as needed
  - You must reduce your diabetes medicines immediately when you start to eat low-carb

The Benefits of Eating Low-Carb

- Keeps blood sugars more normal, fewer highs and lows
- People feel better quickly when blood sugars are normal
- Reduces insulin resistance
- Keeps natural insulin levels normal
  - High insulin levels cause weight gain and hunger
  - High insulin levels with insulin resistance raise blood pressure, cholesterol, triglycerides, blood clotting, inflammation and free radicals
- Can reduce the need for medicine for blood sugar, blood pressure, cholesterol, and neuropathy
- Reduces and sometimes reverse diabetes complications by keeping blood sugar, insulin resistance and insulin levels normal
- Reduces hunger
- Makes weight loss much easier
- Rests the Beta cells (the cells that make insulin) and prolongs their life

Carbs vs Pancreas

Diabetics already ate their lifetime supply of carbs

How Do I Eat Low-Carb?
Protein and 2-3 veggies every meal.

PROTEIN each meal

- Walks, swims, or flies
  - any animal of land, sea or air
  - 3 oz =size of deck of cards
- Eggs or eggbeaters
- Cheese (low fat best)
- Nuts
- Soy, small portions of beans (frijoles, lentils, etc)
- Nutty seeds (sunflower, pumpkin, sesame)
- 8-16 oz total every day

2-3 VEGGIES each meal

- Lettuce, spinach, cabbage, greens, any leaves
- Yellow or green squash
- Broccoli, cauliflower, cabbage
- Peppers, chilis
- Green beans, pea pods
- Avocados, eggplant, okra
- Celery, cucumber
- Small amounts onion, tomato
- Many others

OIL is OK

What Do I Avoid?
Grains, Roots, Fruits, Milk.

- No Grains
  - Wheat: not whole wheat either
  - Corn: not fresh, canned, corn meal or masa
  - Rice: not brown or white
  - Oats: has lots more bad starch than good fiber
  - Rye: not dark either
  - Not amaranth, teff, quinoa, triticale, etc
- No Roots
  - Potatoes, sweet potatoes, carrots, beets
  - A little radishes, onions and garlic for flavor OK
- No Fruits
  - No juice
  - All the vitamins, antioxidants and fiber you need are in veggies
  - (Berries have the lowest carbs)
- No Milk (lactose)
  - Not nonfat, 2% or whole
  - 10 oz = 1 slice bread = 15 grams carbs
  - Cheese is OK (all the lactose is fermented out)

How do I eat wisely?

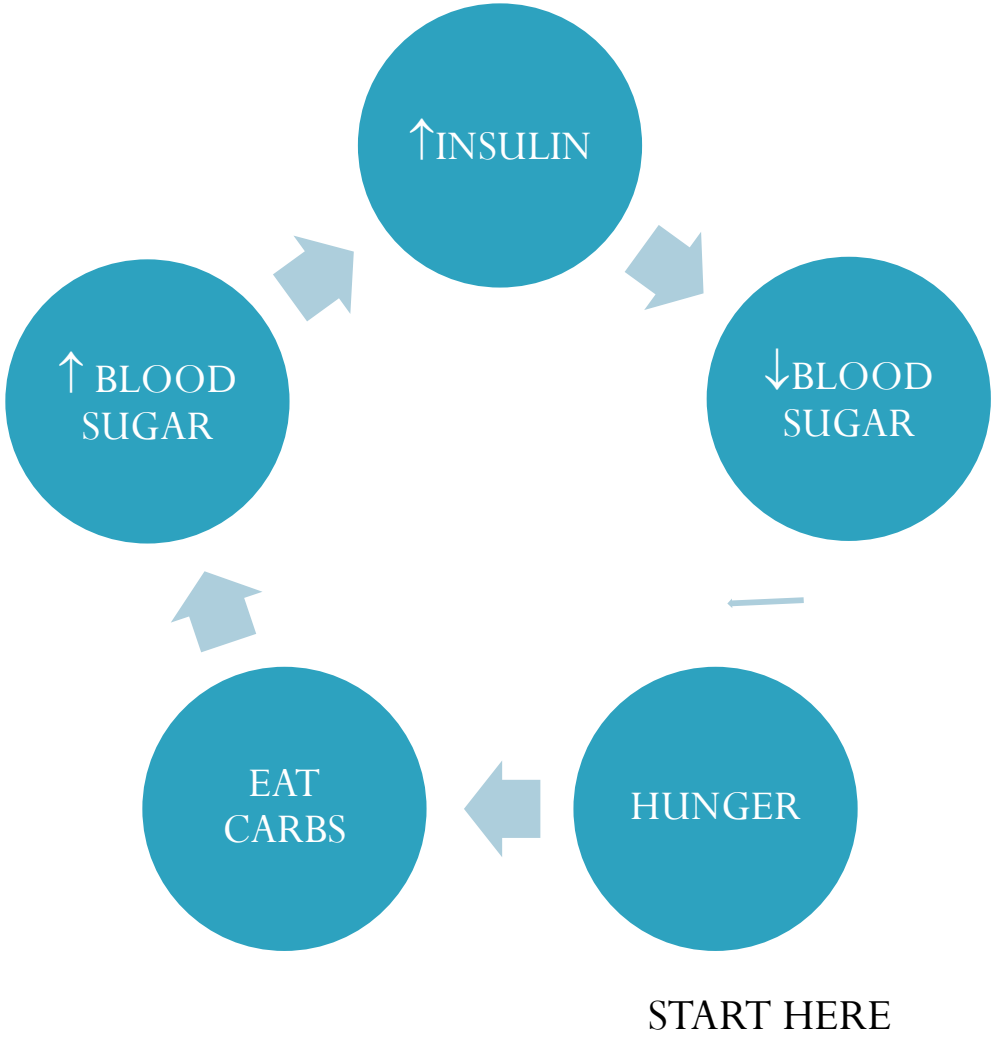
- 3 meals a day- protein and 2-3 veggies
- Eat breakfast every day within 2 hours of getting up
- Protein or veggie snacks
- Oil is OK, don't deep fry
- No sweet drinks
- No roots, fruits, grains or milk (carbs)
- No whole grains (bulk 100% wheat bran OK)
- It's OK to eat small portions of carbs right before you exercise, they go straight to the muscles

How do I eat wisely?

- Put sauces on vegetables instead of on pasta, rice or potatoes
- Low carb desserts (like Carb Smart Ice Cream) and low carb chocolate are OK in small portions. They have some carbs.
- 30 minutes of exercise burns 15 grams of carbs (for splurges)
- Check your sugar 1 hour after a splurge, it makes it easier to avoid that splurge next time
- Read nutrition labels, it only takes once for each food
- Get carbs out of the house, or out of sight (low cupboard)
- "Honey, can I have a bite of yours?" You can have tastes of carbs. Just make sure you have filled up with good, wise food first, so you can resist eating the whole dessert

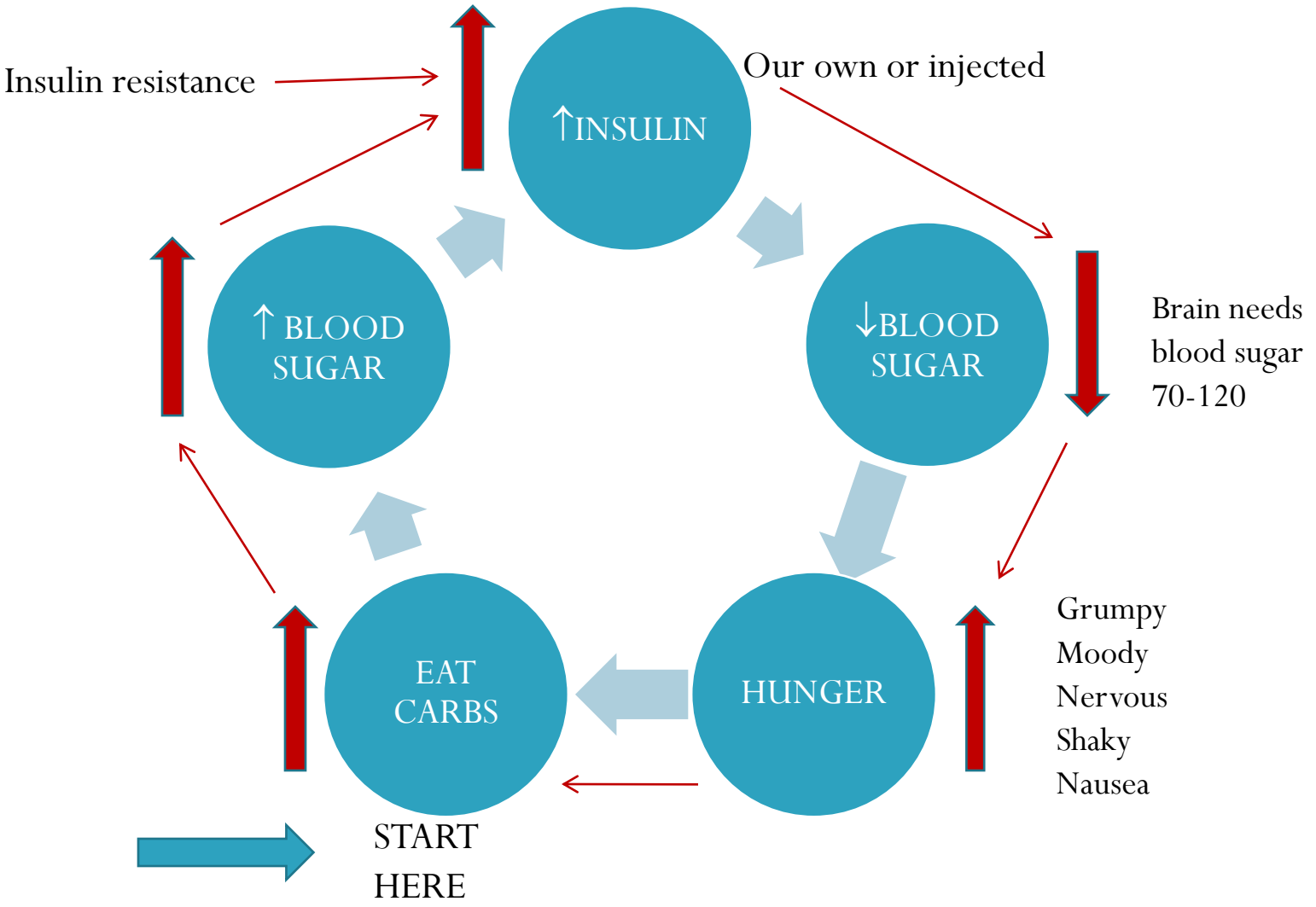
But I don’t want to give up carbs!

NORMAL CARBOHYDRATE-INSULIN CYCLE



But I don't want to give up carbs!

CARBOHYDRATE-INSULIN-HUNGER VICIOUS CYCLE

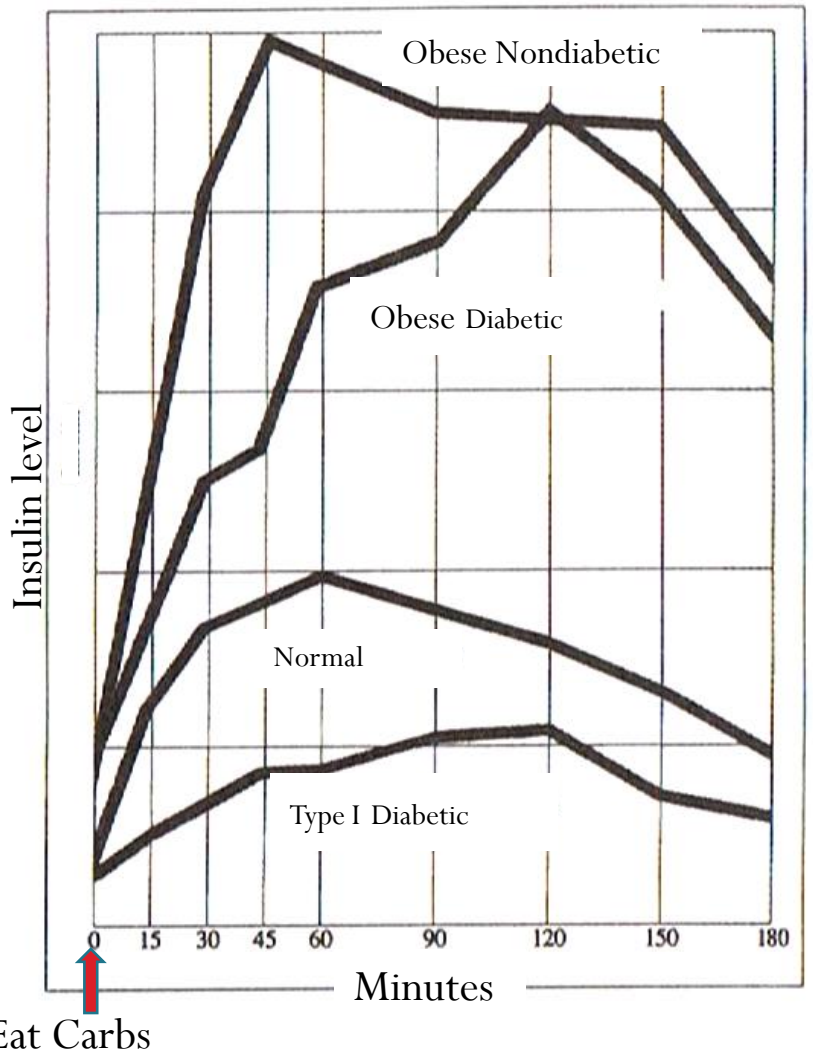


Good News!

- When you stop eating carbs:
  - You lose your craving for carbs quickly
  - You break the carb-insulin-hunger cycle right away
  - It's much easier to lose weight without being hungry

Insulin Response to Eating Carbs

This is INSULIN level, not sugar →



REMEMBER

- Every day we start with normal insulin levels
- Insulin levels only go high when we eat carbs
- Carbs make you hungry and store fat

From Dr. Bernstein's Diabetes Solution, 2007

Answers to Concerns About Low Carb Diets

- It's boring: There are lots of common low carb alternatives, carbs are bland anyway, substitute just the carb with a low carb vegetable, like zucchini, cauliflower, green beans, lettuce, etc.
- Miss the nutrition in fruit: Veggies have all the same vitamins, enzymes and minerals as fruit
- Too much oil and fat: Not the problem, high insulin levels raise your cholesterol, oil doesn't
- Too much protein: Many recent human studies show protein is not bad for kidneys unless they are almost gone, but high sugar is deadly to kidneys always. High protein diets are bad for rat kidneys not humans.
- Costs too much: Not when you stop sweet drinks and eat smaller quantities naturally (less hungry)
- When you start to eat lower carb, YOU MUST REDUCE YOUR DIABETES MEDICINE DOSES, talk to your doctor.

Numbers

- 4 g carbs = 1 teaspoon sugar
- 15 g carbs = 1 ADA exchange or portion = 4 teaspoons sugar
  - 1 slice bread, 1 corn tortilla
  - ½ cup soft carbs: hot cereal, potatoes, corn, peas
  - 1/3 cup rice
  - 1 small fruit, 4 oz juice
  - 10 oz nonfat milk (or whole or 2%)
- 15 g carbs raises blood sugar about 50 points in diabetics
- 30 minutes walking lowers blood sugar 50 points in diabetics
- Normal blood sugar is 70-120
- Goal: less than 100 fasting
  less than 120-140 1 hr after food

Diabetes Self Care and Prevention

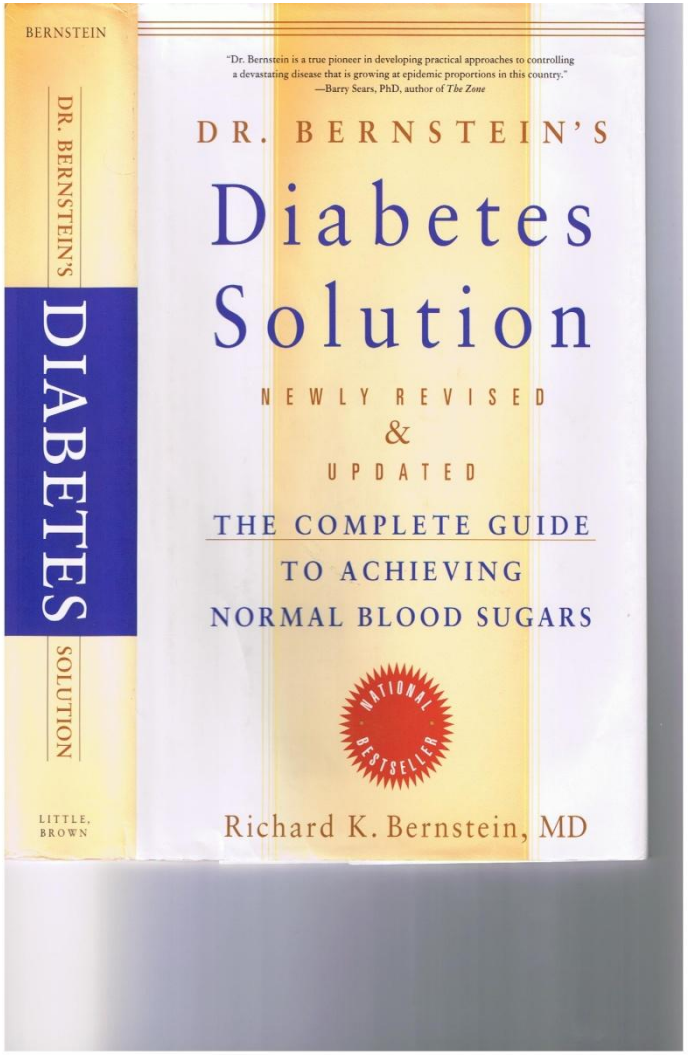
- Diet and exercise are the foundation
- Protein and 2-3 veggies every meal
- You already ate your lifetime supply of carbs
- High insulin levels raise your cholesterol
- High insulin levels make you hungry
- Exercise is medicine
- The truth shall set you free: Test your sugar, don't guess!
- Take good care of your beta cells
- Don't turn your body into plastic
- An attitude of gratitude makes everything easier
- We can feel great and live long, good lives!

Dr. Bernstein's Book
What he does works!

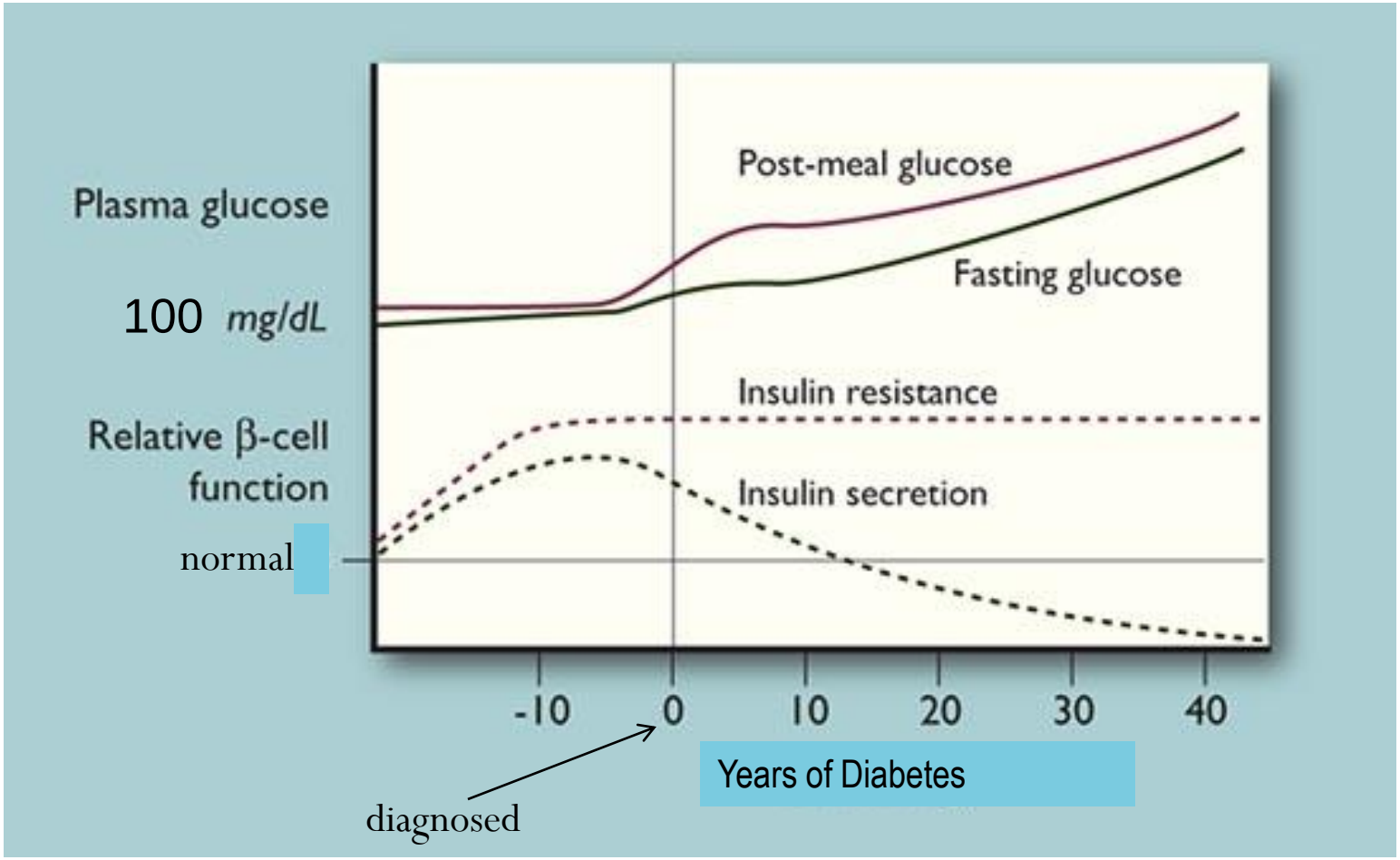
Dr. Richard Bernstein is a 75 year old practicing physician, on insulin since he was 12 years old.
He was an engineer who worked hard to learn how to control his brittle diabetes very well.
At the age of 40 he went to medical school to be able to teach others how to control their diabetes, to prevent and reverse the complications of uncontrolled sugars.

This is an excellent, easy to understand guide to <u>all</u> aspects of diabetes, explaining how the body works, and exactly how to take care of it.

You can read it online at www.diabetes-book.com



Natural History of Type 2 Diabetes



Adapted from International Diabetes Center, Minneapolis, MN.)

See the next page for an explanation of this graph.

Natural History of Type 2 Diabetes

In the development of type 2 diabetes, insulin resistance is present for years before the diagnosis of diabetes.

Beta cells increase insulin secretion in response to insulin resistance and for a period of time are able to effectively overcome it and maintain blood sugar levels below the diabetic range.

However, when beta cell function begins to decline, insulin production is insufficient to overcome the insulin resistance, and blood sugar levels increase.

As illustrated, the increase in blood sugar is paralleled by the decline in beta cell function.

Note that once it is established, insulin resistance remains relatively stable over time, if the person does not change the way they eat, drink and exercise.

Therefore, progression of diabetes is a result of worsening beta cell function with continuing insulin resistance, as the beta cells wear out and die off.

Note also that the increase in after-meal blood sugar begins to occur before the increase in fasting blood sugar. This is a good reason to check sugars after eating to diagnose diabetes and pre-diabetes earlier.

(*Adapted from* International Diabetes Center, Minneapolis, MN.)