THE INSTITUTE OF NUTRITIONAL ENDOCRINOLOGY®

BIOFIT

BLUEPRINTBOOTCAMP

Blood Chem – Blood Sugar

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Blood Sugar Markers

- ✓ **Glucose - fasting:** Ideal 75 - 85
- ✓ **Triglycerides:** Ideal 50 - 100
- ✓ **Insulin:** Ideal 2 - 5

Follow-up if glucose above the optimal range or if clinical find... suggest blood sugar issues:

- ➢ Hemoglobin A1C
- ➢ Glucose meter

If fasting glucose is high and hemoglobin A1C is normal, it may be a vitamin B1 deficiency (which also has CO2 <25, LDH <140)

Home Testing for Insulin

Fasting Insulin Blood Spot Test

Choose Options

Item #:	ZRT-IN
Price:	$35.00
Quantity:	1

Add to Cart

OR

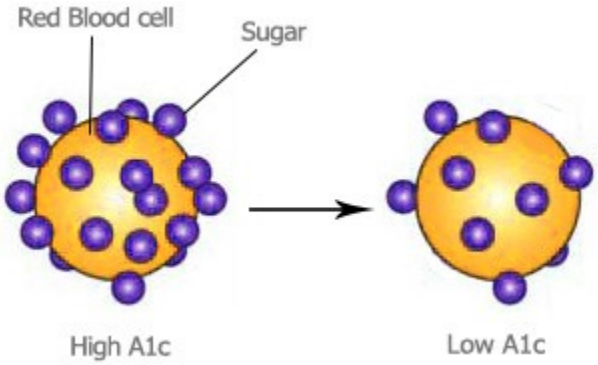
Add To Wishlist

Earn up to 35 Reward Points

No Longer Available

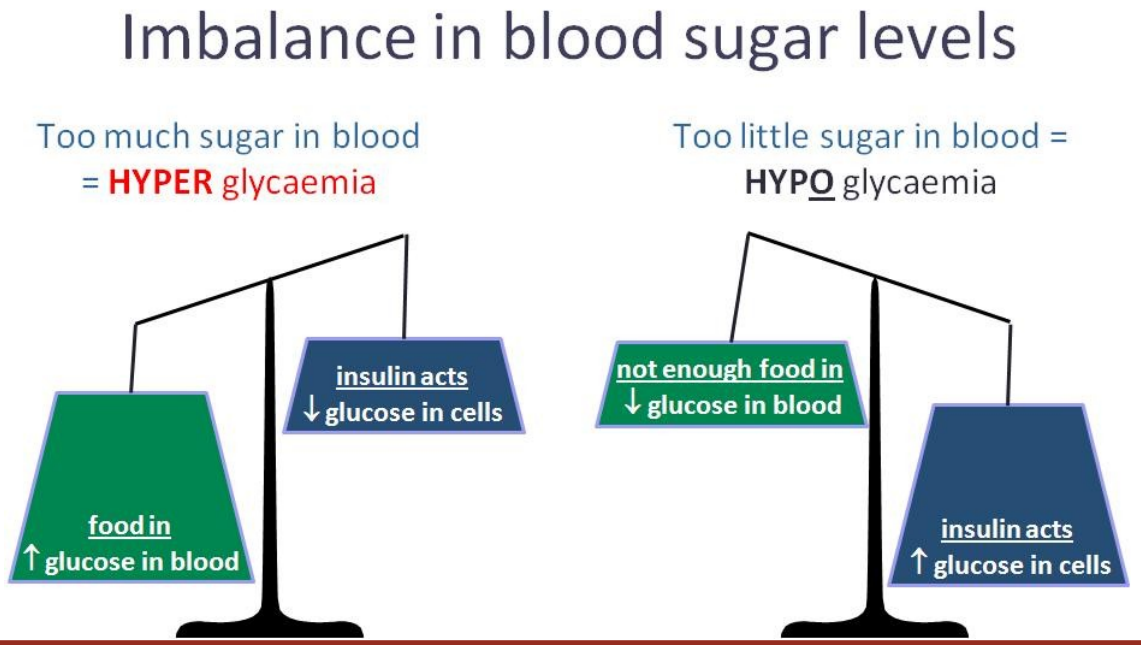
Hemoglobin A1C

- ✓ Indirect measure of blood sugars over a **120-day period**
- ✓ Glucose gets **attached to hemoglobin** when levels of blood sugar are high
- ✓ **Glycosylation is irreversible** – you'll only see a change after 120 days when all RBCs have replaced themselves
- ✓ Good **long-term measure** of glucose control
- ✓ Run when glucose is high or low or follow-up for diabetes
- ✓ **Optimal range:** 4.5 - 5.0 %
- ✓ Can be **decreased in hypoglycemia** or hemolytic anemia, blood loss, and pregnancy



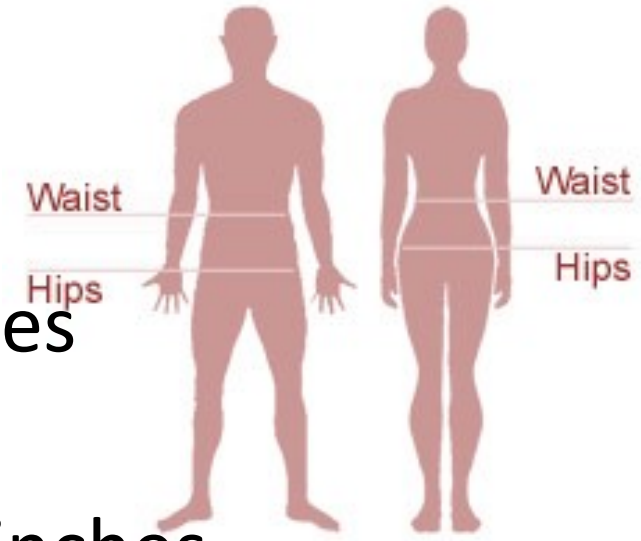
Blood Sugar Imbalance Conditions

- ✓ **Hypoglycemia**
  - ➢ Low Blood Sugar
- ✓ **Insulin Resistance**
  - ➢ Metabolic Syndrome
- ✓ **Diabetes**
  - ➢ Type 1
  - ➢ Type 2



Insulin Resistance

- ✓ High glucose (> 100, less than 120)
- ✓ Possible hemoglobin A1C > 5.7
- ✓ Fasting insulin > 5
- ✓ Increased weight around the waist
  - ➢ Waist: hip ratio > or equal to 1 in a male, or waist > 40 inches
  - ➢ Waist: hip ratio > or equal to 0.8 in a female, or waist > 35 inches



Syndrome X
aka Metabolic Syndrome

- ✓ Increased risk of cardiovascular disease
- ✓ Triglycerides > 110 or 1.24 mmol/L
- ✓ Total cholesterol > 220 or 5.69 mmol/L
- ✓ HDL cholesterol < 55 or 1.42 mmol/L
- ✓ Glucose > 100
- ✓ Fasting insulin > 5
- ✓ High blood pressure
- ✓ Hemoglobin A1C > 5.7
- ✓ Increased weight around the waist
  - ➢ Waist: hip ratio > or equal to 1 in a male, or waist > 40 inches
  - ➢ Waist: hip ratio > or equal to 0.8 in a female, or waist > 35 inches

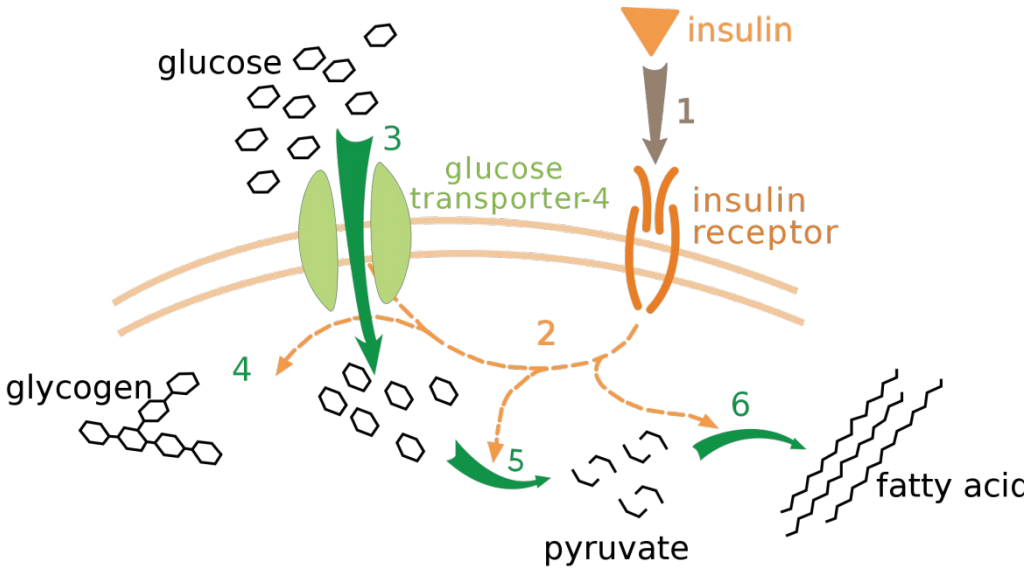
Assessment of Diabetes

- ✓ **High Glucose:** > 120 on 2 tests
- ✓ **Hemoglobin A1C:** > 6.5 [1]

  1 http://www.drritamarie.com/go/Ref6RoleA1CAssayDiabetes
- ✓ **Triglycerides:** > 110 usually
- ✓ **Cholesterol:** > 220 usually
- ✓ **HDL:** < 55 usually
- ✓ **Blood Pressure:** increased

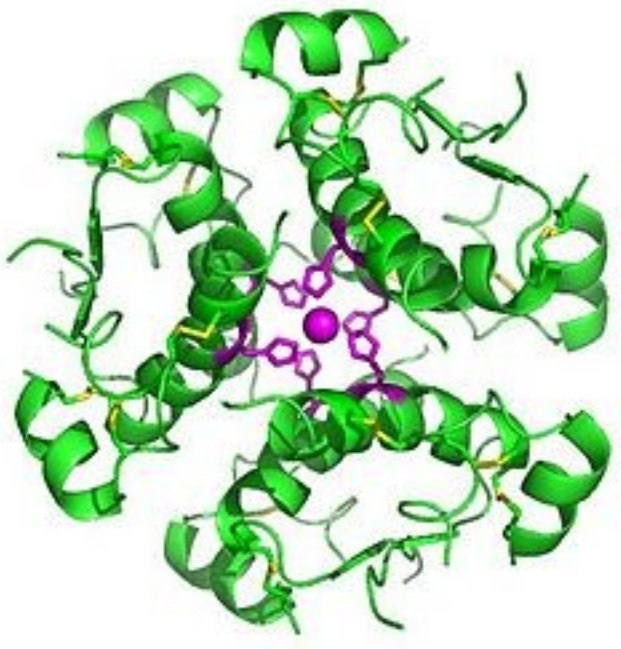
Normal Insulin Function

- ✓ After a meal, the increased glucose and/or amino acids in the blood **cause the pancreas to secrete insulin**.
- ✓ Insulin binds to the cell membranes and **triggers glucose receptors** in cell membrane.
- ✓ Glucose, amino acids, fats, magnesium, and other nutrients **transported into the cell**.
- ✓ Once the nutrients are cleared from the blood, **the pancreas stops secreting insulin.**



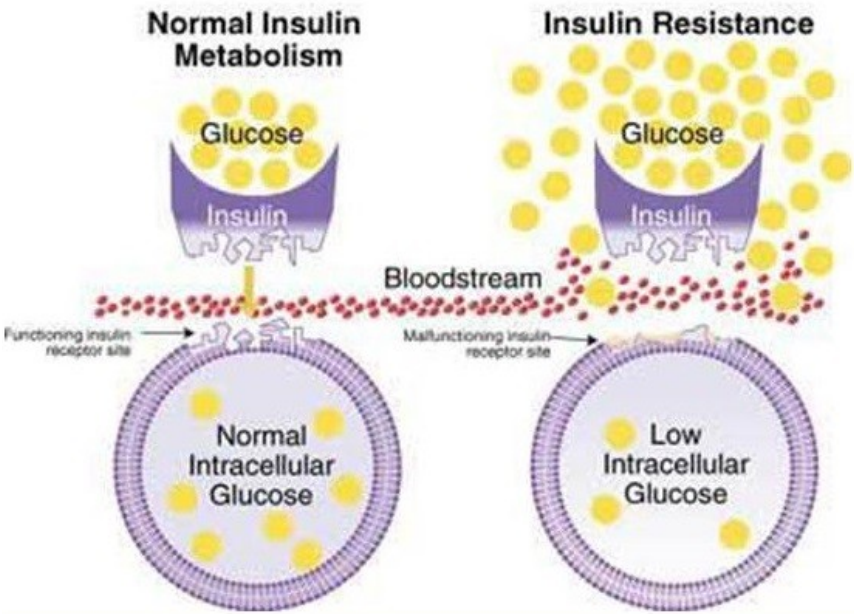
Effects of Insulin Binding

- ✓ Preferential use of **glucose over fat** as fuel
- ✓ **Inhibits the burning of fat** by the cells
- ✓ Inhibits growth hormone
- ✓ Slightly depresses thyroid effects by **blunting conversion of T-4 to T-3**



Insulin Resistance Effects

- ✓ Either the **circulating insulin does not bind** to the insulin receptors on the cell…
- ✓ Or it binds, but its effects are deficient and the **nutrients are not efficiently cleared** from blood.
- ✓ Pancreas continues to **secrete more insulin** causing high levels of insulin for a long period of time before nutrients are cleared.
- ✓ Results in deficient function in insulin resistant cells (liver, fat, untrained muscle).



Negative Effects of Insulin Resistance

- ✓ **Deficient function** in insulin resistant cells due to insufficient energy production
- ✓ **Excess anabolic effects:** increased body fat, especially around the middle
- ✓ **Oxidation in non-insulin-resistant cells** exposed to excess insulin - i.e. damage to blood vessel linings
- ✓ **Systemic inflammation:** elevated inflammatory marker
- ✓ **Hypertension:** "thick" blood, water retention, suppressed fat burning
- ✓ **Adverse systemic effects** of blunted growth hormone and thyroid hormone

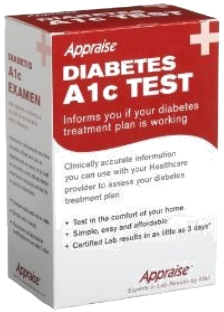
What Causes Insulin Resistance?

- ✓ **Genetic predisposition:** By age 60, 40% of Americans have at least 3 markers and 60 - 70% have at least one
- ✓ **Omega-3 deficiency:** DHA (Docosahexaenoic acid)
- ✓ ⇑ **Omega 6:3 ratio** or trans fats in cell membrane
- ✓ **Deficiencies** of chromium, magnesium, zinc, B-vitamins, and possibly boron and lithium
- ✓ **Lack of resistance exercise,** manual labor, and trained muscle mass
- ✓ **Sugar,** processed foods, starches, fruit juices and soda
- ✓ **Stress** via hypercortisolemia
- ✓ **Insufficient protein** or protein malabsorption

Blood Sugar Tracking

- ✓ Glucometer

- ✓ Hemoglobin A1C



Home Glucose Tolerance Test

1. Measure fasting blood sugar.
2. Eat a test meal. Write down exact ingredients, including amounts of each food or beverage.
3. Measure blood sugar immediately after meal.
4. Measure blood sugar ½ hour after meal.**
5. Measure blood sugar 1 hour after meal.
6. Measure blood sugar at 2, 3, 4, 5 and 6 hours after meal.

*** even better to measure every 15 minutes for 90 minutes*

Do with several representative test meals.

Glucose Tolerance Test Results

- ✓ Max should be 110
- ✓ Ideal peak 99 - 100
- ✓ Blood sugar never dips below starting point

Consequences of Insulin Resistance

- ✓ Cardiovascular disease
  - Effects on triglycerides
  - Up regulates cholesterol synthesis
  - Effects on coagulation
  - Lowers HDL
- ✓ Hypertension
- ✓ Weight loss resistance – leptin resistance
- ✓ Fatty liver and impairs detoxification
- ✓ Leads to androgen dominance – PCOS
- ✓ Reduction in glutathione and phase II liver detoxification
- ✓ Cancer: pancreatic, colon, and breast

Medications That Hinder Insulin Regulation and Blood Sugar

Hyperglycemia

- ✓ Corticosteroids
- ✓ Phenytoin (anti-seizure meds)
- ✓ Estrogen (birth control pills, estrogen replacement therapy)
- ✓ Thiazides (diuretics)

Hypoglycemia

- ✓ Alcohol
- ✓ Insulin
- ✓ Propranolol (hypertension RX)
- ✓ Oral diabetes medications

Latent Autoimmune Diabetes in Adults (LADA)

- ✓ **Glutamic Acid Decarboxylase Antibodies** (GADA): Causes increased glutamate and decreased GABA in pancreas
- ✓ **Insulin Antibodies:** Attack insulin
- ✓ **Islet Cell Antibodies:** Attack insulin producing cells in pancreas
- ✓ **Zinc transporter autoantibodies** (ZnT8): Attack the protein responsible for the uptake of zinc in the membrane of insulin secretory granules
- ✓ **Tyrosine phosphatase antibodies:** Attack the protein that regulates cytokine-induced pancreatic beta cell apoptosis
- ✓ **C-Peptide:** Low - measures residual beta cell function by determining the level of insulin secretion

Blood Sugar Case - Hypoglycemia

CATEGORIES	Units	PATHOLOGICAL RANGE		FUNCTIONAL RANGE		CURRENT 27/02/10
		Min	Max	Min	Max	
Lab Corp Markers						
Glucose, serum	mg/dl	65.0	110.0	75.0	89.0	74
TSH	mIU/L	0.3	5.7	1.8	3.0	7.17
Thyroxine (T4)	ug/d	4.5	12.5	6.0	12.0	
T3 Uptake	md/dl	27.0	37.0	28.0	38.0	
Free Thyroxine Index	mg/dl			1.2	4.9	
Total Triiodothyronnine (TT3)	ng/dL			100.0	180.0	
Free T4	ng/dL			1.0	1.5	1.227
Free T3	pg/mL			300.0	450.0	275.32
LDH	U/L	89.0	215.0	140.0	180.0	273

