(Diabetes Mellitus)

Diabetes mellitus is a group of metabolic diseases characterized by elevated blood glucose levels (hyperglycemia) resulting from defects in insulin secretion , insulin action or both .

The chronic hyperglycemia of diabetes is associated with long-term damage , dysfunction and failure of different organs especially the eyes , kidneys , nerves , heart and blood vessels .

Glucose: Obligate fuel for CNS & RBC's

- CNS/Brain
  - Dependent on glucose as primary source of fuel
    - Uses ~120g glucose/day of total 160-200 g/d
- RBC
  - Dependent on glucose
  - Lack mitochondria

DM is caused by an absolute or relative insulin deficiency .

It has been defined by the WHO on the basis or laboratory findings , as a fasting venous plasma glucose concentration greater than 120 mg/dl or greater than 180 mg/dl two hours after a carbohydrate meal or two hours after the oral ingestion of the equivalent of 75 gm of the glucose even if the fasting conc. is normal .

DM is divided into two types :

1. insulin – dependent DM (IDDM)

It is caused by an inability of the body to produce insulin , IDDM causes :

-hyperglycemia (abnormally blood glucose conc.)

- poly dispsia (excessive thirst)
- poly uria (exceesive urine production)
- poly phagia (increased appetite)
- weight loss (due to increased breakdown of fat and tissues protein) .

IDDM due to the destruction of the insulin producing B-cells of the pancreatic islets.

-It is usually presents during childhood or before age 40 .

- It has been suggested that many cases follow a viral infection ,which has destroyed the B-cells of the pancreatic islets .

- Treatment requires insulin .

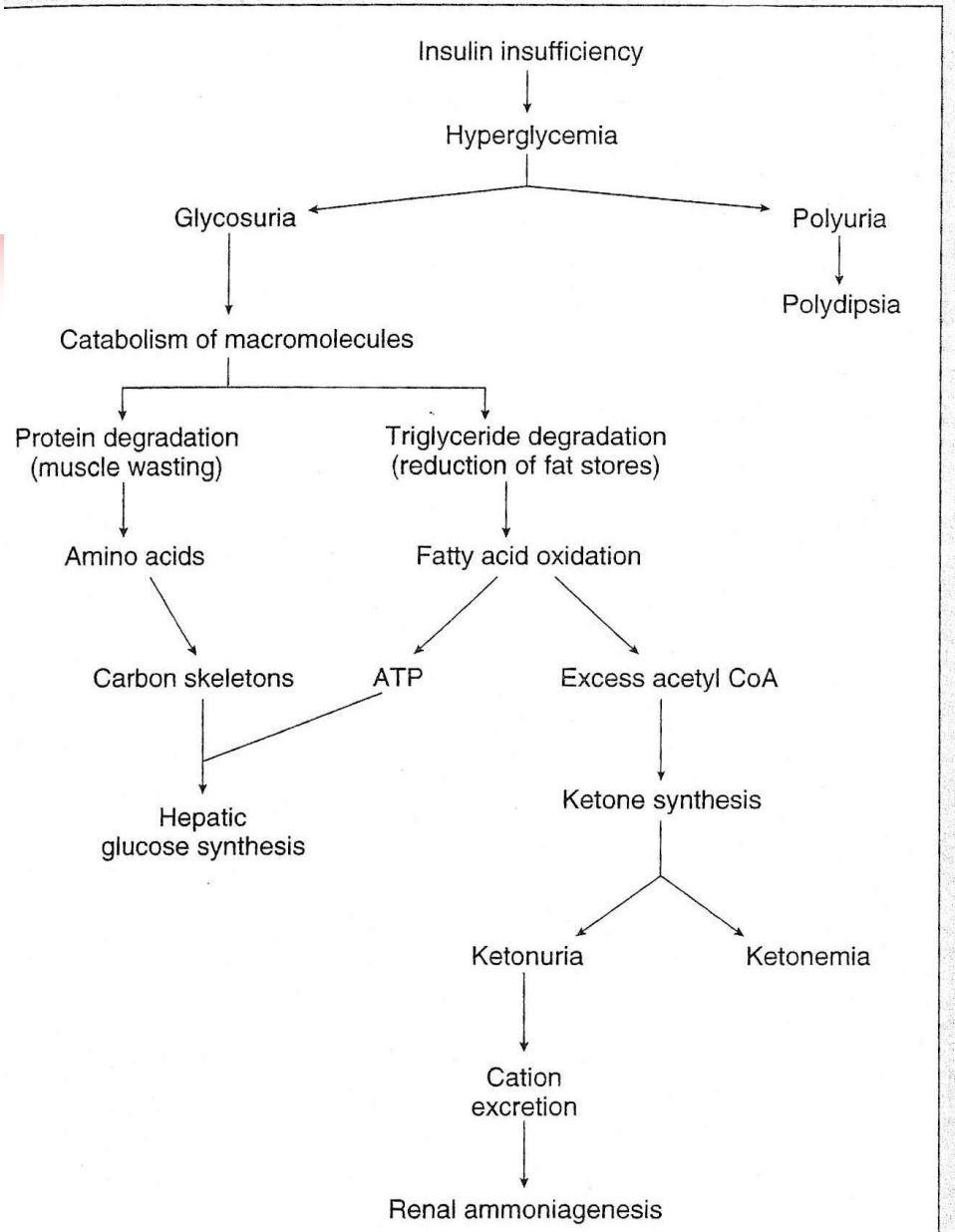

FIGURE 9-3

Metabolic Consequences of Insulin Insufficiency. *Both anabolic pathways (gluconeogenesis) and catabolic pathways (protein degradation, triglyceride hydrolysis, fatty acid oxidation, ketogenesis, and ammoniagenesis) are activated in the absence of insulin.*

In this type occur :

- Lowering of the pH of the blood due to circulating keto acids (acidosis) .
- Increased level of lipids , fatty acids and cholesterol in the blood (lipemia) .
- Negative nitrogen balance due to the conversion of more amino acids into glucose (increased gluconeogenesis) .
-Increased production of KBs by the liver and their incomplete utlization by tissues leading to their accumulation in blood (ketosis)and elimination in urine(ketnuria)

-increased tendency to develop cataract in the eye and arteriosclerotic lesions of blood vessels .

2.Non-insulin depended DM (NIDDM)

- Often due to insulin resistance by the tissues (resistance to its action or of postreceptor defect) .

-Onset is most common during adult life (after age 40) .

- Most common form .

- Treatment with hypoglycemia agent or insulin may be required .

Contributing factors of type 2 :

- Obesity .
-Lack of physical activity .
- Age (onset of puberty is associated with increased insulin resistance) .
- Genetic predisposition .
- Conditions associated with insulin resistance such as poly cystic ovary syndrome , hypertension and dyslipidemia .

Treatment for type 1 and type 2 of DM

- Taking injections of insulin .
- Sometimes taking medicines by mouth .
- Making healthy food choices .
- Being physically active .
- Controlling your blood pressure levels .

Blood pressure is the force of blood flow inside your blood vessels .

- Controlling your cholesterol levels .

(Hypoglycemia)

-A blood glucose conc. of 45mg/dl or less .

-The brain and the CNS need a continous supply of blood glucose to serve as fuel for energy metabolism .

- Transient hypoglycemia can cause cerebral dysfunction .Sever prolonged hypoglycemia can cause brain death .

- Glucagon and epinephrine are the most important hormones in preventing it .

Low blood glucose can come on fast and can be caused by :

1 . Taking too much diabetes medicine .

2 . Missing or delaying a meal .

3 . Being more physically active than usual .

4 . Drinking alcoholic beverages .

Gestational diabetes

Gestational diabetes can develop when a woman is pregnant . Pregnant woman make hormones that can lead to insulin resistance . Overweight or obese woman have a higher chance of gestational diabetes .

Gestational diabetes often goes away after the baby is born . However , a woman who had gestational diabetes is more likely to develop type 2 diabetes later in life .

Notes :

1 . Hyperglycemia may be due to :

- DM
- Intravenous infusion of glucose containing fluids .
- Sever stress (temporary effect) such as cerebro vascular accidents (CVA) .

2.Hypoglycemia should be treated by urgent intravenous administration of to 20ml of at least 10 percent and in adults 50 percent glucose solution after with drawal of a blood glucose sample for glucose and insulin assays .

3. Absolute insulin deficiency due to pancreatic diseases (chronic pancreatitis, haemochromatosis , cystic fibrosis) .

4. Relative insulin deficiency due to the excessive growth hormones (acromegaly) or increased plasma glucocorticoid conc. due to the administration of steriod (Ushing's diseases) . In human the major glucocorticoid is cortisol (hydrocortisone), Glucocorticoid stimulate the degradation of muscle protein .