DIABETES MELLITUS
PATHOLOGY

Benyamin Makes
Anatomic Pathology – FMUI
Jakarta
Endocrine Pancreas

- The islets of Langerhans are scattered throughout the pancreas but are most numerous in the distal portion (tail).
- Several types of endocrine cells.
  - Beta cells produce insulin,
  - alpha cells produce glucagon,
  - other cells secrete somatostatin, vasoactive intestinal polypeptide.

Fig D.07.03 – The pancreas is positioned near the duodenum, and releases digestive enzymes into the duodenum. Specialised cells called Beta cells release Insulin into the blood stream in response to blood glucose concentration.
Normal islets of Langerhans, on the right with immunoperoxidase staining for insulin to identify beta cells and on the left with immunoperoxidase staining for glucagon to identify alpha cells, are shown here.
Here is a normal pancreatic islet of Langerhans surrounded by normal exocrine pancreatic acinar tissue. The islets contain alpha cells secreting glucagon, beta cells secreting insulin, and delta cells secreting somatostatin.
INSULIN – Metabolic action

- Insulin is the only hormone that decreases blood glucose.
- Insulin travels to its target sites of liver, muscle, and fat cells.
- Glucose can enter these cells only with the aid of insulin.
- Insulin binds with a cellular receptor site to exert its effect.
Diabetes Mellitus

• Disorder of metabolism (Carb, Prot & Fat)
• Due to Absolute or relative deficiency of insulin.
• Characterized by hyperglycemia.

• Clinically: Polyuria, Polydypsia, Polyphagia.
Classification

• **Primary DM.**
  - Type I – IDDM / Juvenile – 10%.
  - Type II – NIDDM / Adult onset – 80%.
  - MODY – 5% maturity onset - young – Genetic
  - Gestational diabetes

• **Secondary DM** – islet destruction.
  - Infectious – congenital rubella, CMV.
  - Pancreatitis/tumors/Hemochromatosis.
  - Drugs – Corticosteroids.
PRIMARY DIABETES

Type I Diabetes
(~20% - IDDM)

Type II Diabetes
(~80% - NIDDM)

hyperglycemia

• Blood vessels
• Kidneys
• Eyes
• Nerves
Pathogenesis of Type I DM

- Genetic
  - HLA-DR3/DR4

- Environment?
  - Viral infection??

Autoimmune Insulitis

β cell Destruction

Severe Insulin deficiency

Type I DM
Pathogenesis of Type II DM

β cell defect
Genetic

Environment
Obesity ???

Abnormal Secretion

Insulin resistance

Relative Insulin Def.

β cell exhaustion

Type II DM

IDDM
GENETIC PREDISPOSITION

Multiple genetic defects

PRIMARY BETA-CELL DEFECT

Deranged insulin secretion

ENVIRONMENT

Obesity

PERIPHERAL TISSUE INSULIN RESISTANCE

Inadequate glucose utilization

HYPERGLYCEMIA

Beta-cell exhaustion

TYPE II DIABETES
Pancreatic pathology in diabetes

• Type I:
  – Reduction in number and size of islets
  – T lymphocyte infiltration
  – Beta-cell degranulation (by EM)

• Type II:
  – Amyloid replacement and fibrosis
An islet of Langerhans demonstrates insulitis with lymphocytic infiltrates in a patient developing type I diabetes mellitus. This lesion precedes clinical onset of diabetes mellitus and is rarely observed.
An islet of Langerhans demonstrates amorphous pink deposition of amyloid in a patient with type II diabetes mellitus.
Insulin-dependent diabetes (IDDM) (juvenile-onset, or type I)

- Comprises only 20% of cases.
- Begins before age 15 and characterized by abrupt onset;
- Requirement for insulin injection to prevent ketoacidosis;
- Difficulty in maintaining blood sugar levels within normal limits, with marked fluctuations in the blood sugar conspicuous genetic pattern than type II diabetes;
Non-insulin-dependent diabetes (NIDDM) (maturity-onset, or type II)

- Constitutes 80% of cases.
- May need insulin therapy for control of symptoms but do not require it for survival.
Thank You