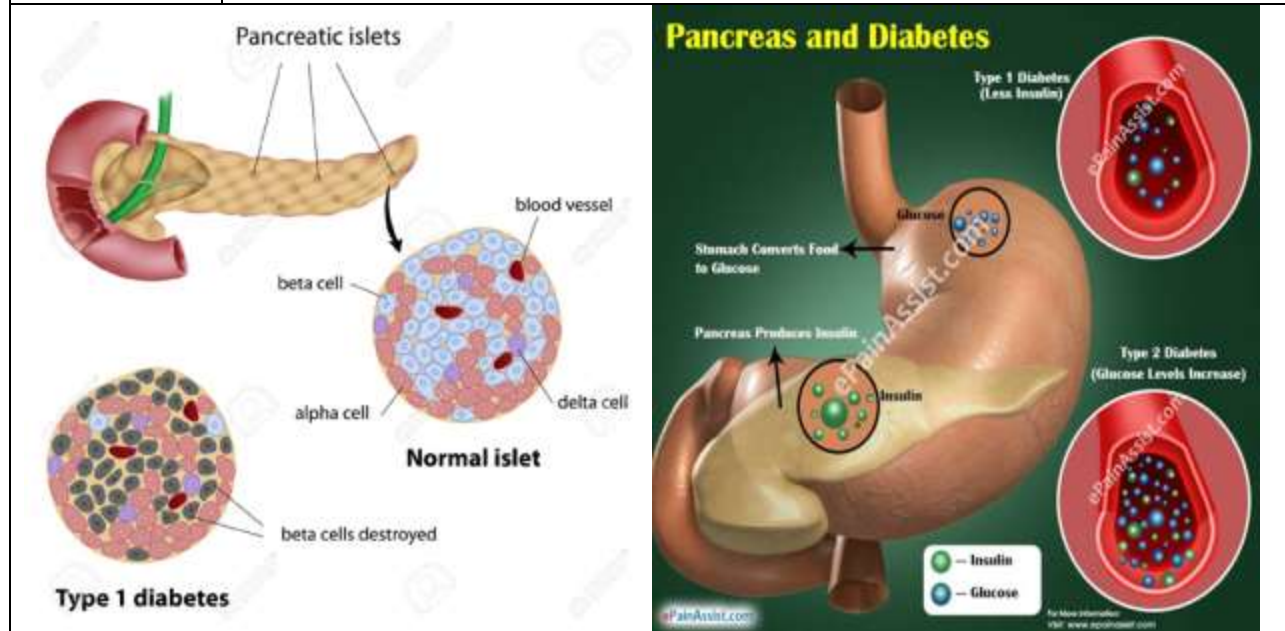


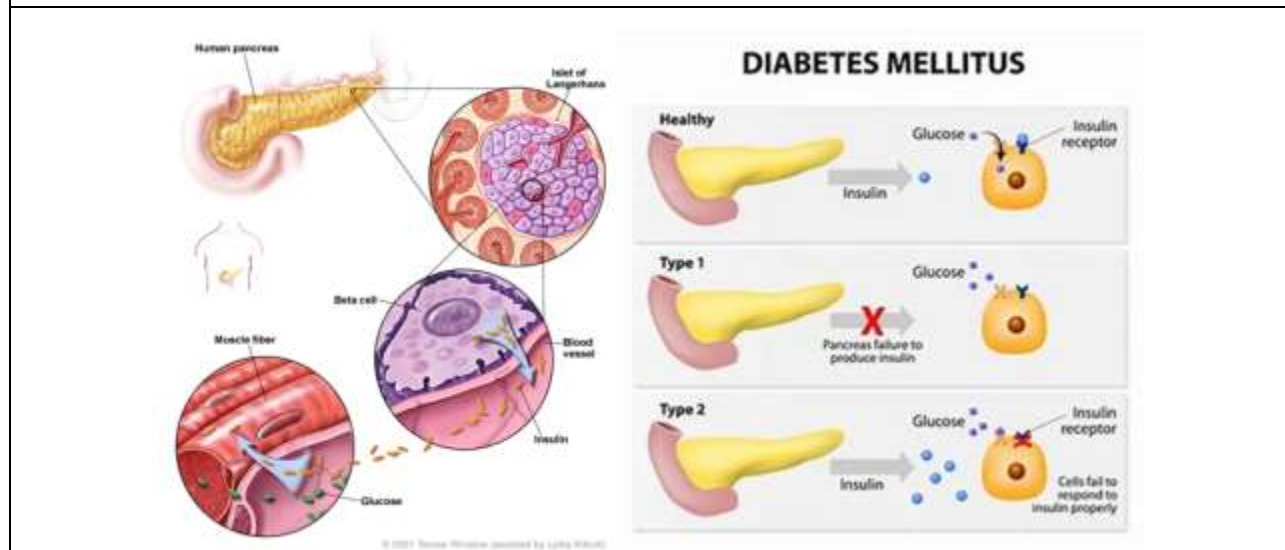
**XVIII. Diseases of Liver, G. Bladder, Pancreas & Peritoneum**  
**Pancreas**

<b>Diabetes Mellitus</b>	
<b>Pancreas</b>	<ul style="list-style-type: none"> <li>• <i>Is about normal in size (or somewhat diminished)</i></li> <li>• <i>Appears slightly paler than normal</i></li> <li>• <i>Evidence of some fibrosis (pearly grey strands)</i></li> <li>• <i>Consistence is moderately increased (firm)</i></li> </ul>



**N.B.1:**

- *This pancreas belonged to a diabetic patient (male aged 58 years) who died of pulmonary tuberculosis.*
- *Histologically, with haematoxylin-eosin stain, there appeared **diffuse fine interacinar fibrosis** of the pancreas with slight diminution (or and evidence of pressure-atrophy) of some of the islets of Langerhans.*
- *After fixation in Zenker's fixative and staining with Gomori's method, the lack of granules of beta-cells and their irregular vacuolation could be demonstrated.*

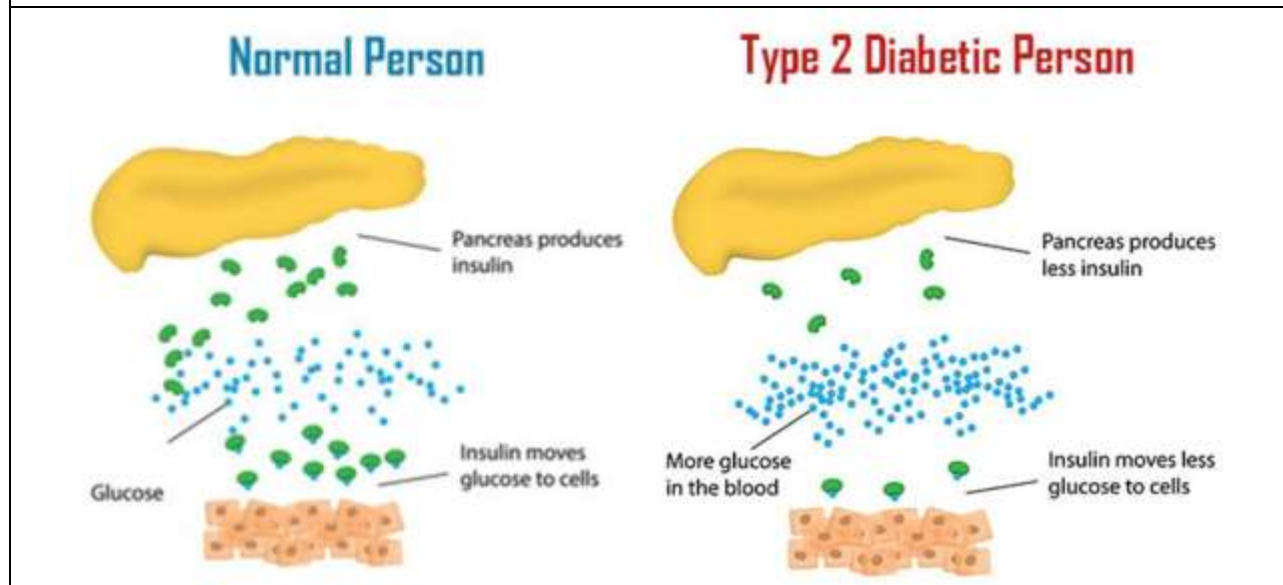


**N.B 2:**

**Diabetes mellitus (hypoinsulinism = sweet-polyuria)**

**Is a generalized metabolic disease (or syndrome) characterized by**

- Hyperglycemia
- With (or without) long-standing glycosuria
- Due to derangement of carbohydrate metabolism as a result of which → disturbance in protein metabolism; and, fat cannot be completely oxidized.
- **Inability to oxidize glucose properly** (or and store sugar in the form of glycogen in the liver) → its accumulation in the blood; and, being too great to be absorbed by the renal tubules → appearance in urine.



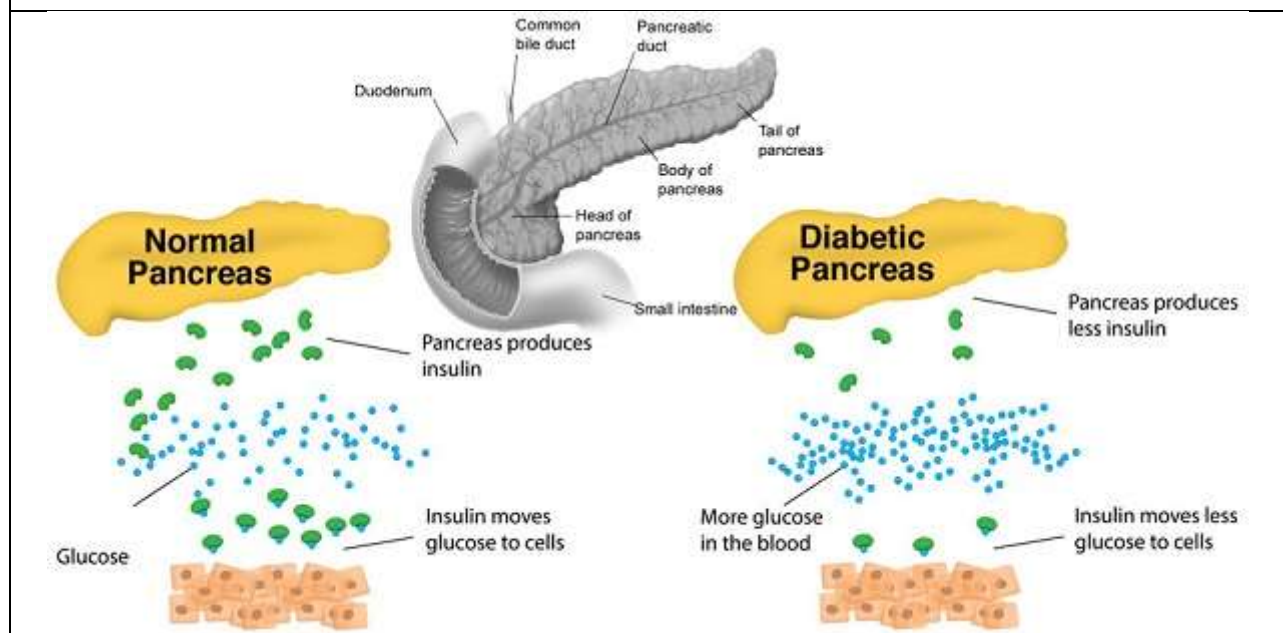
**I – Some causative factors**

**1. Deficiency of insulin produced by islets of Langerhans.**

- The inefficiency is actual or only in relation to the body-needs.

**2. Opposition of the action of insulin by:**

- (a) Hyperthyroidism. .
- (b) Hyperpituitarism. APC
- (c) Cortical hyperadrenalism.



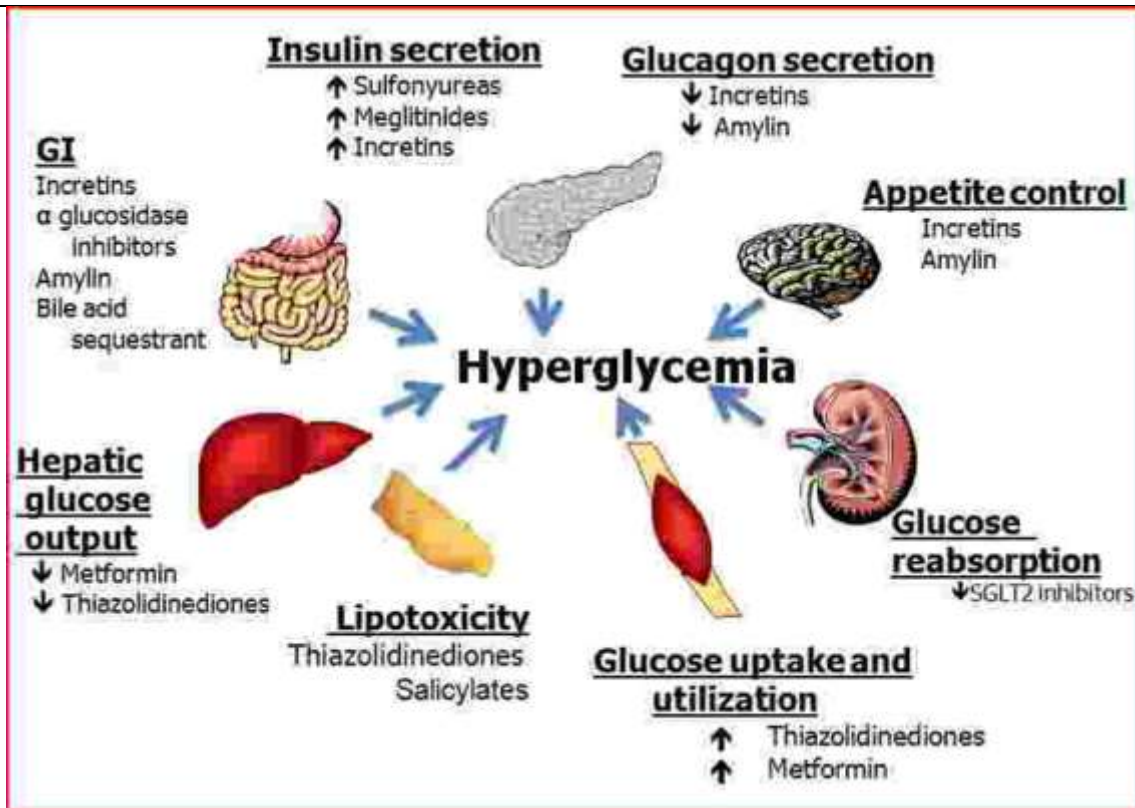
### 3. Hormonal disturbances as proved by:

#### 1- In animals, diabetes could be experimentally produced by:

- (a) Pancreatectomy (in dogs).
- (b) Daily intravenous injections of anterior pituitary extract.
- (c) Intravenous injection of Alloxan to destroy the beta cells.

#### 2- In man, clinical observations showed that:

- (a) Diabetes is often associated with acromegaly.
- (b) Hypophysectomy may ameliorate clinical diabetes.
- (c) Adrenal cortical destruction (**Addison's disease**) may improve diabetes.
  - It seems that the normal balance of regulation of carbohydrate metabolism depends on the liver as well as on the hormonal output of the pancreas, pituitary gland and adrenal glands.
  -

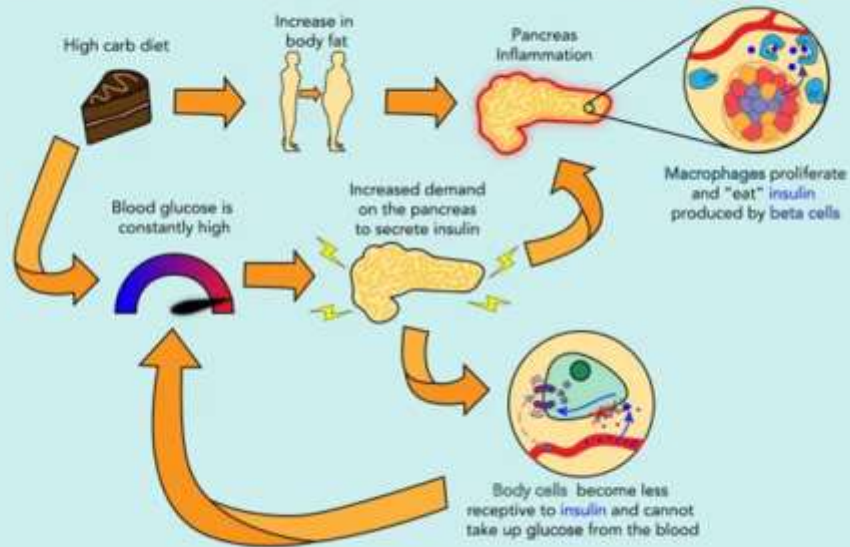


### II – Some precipitating factors

1. **Obesity over middle age; and, over-eating** (specially of carbohydrates) → over-activity, exhaustion and degeneration of the islets,
2. **Strain and stress of life** as in pregnancy and nervous shock.
3. **Infection, sepsis and certain drugs** (corticotrophin-intake).
4. **Certain diseased conditions** such as
  - Atrophic diseases of pancreas,
  - Cushing's disease,
  - Acromegaly,
  - Gall-stones and
  - Liver-diseases.
5. **Deficiency of vitamin B** (important for pyruvic acid destruction).

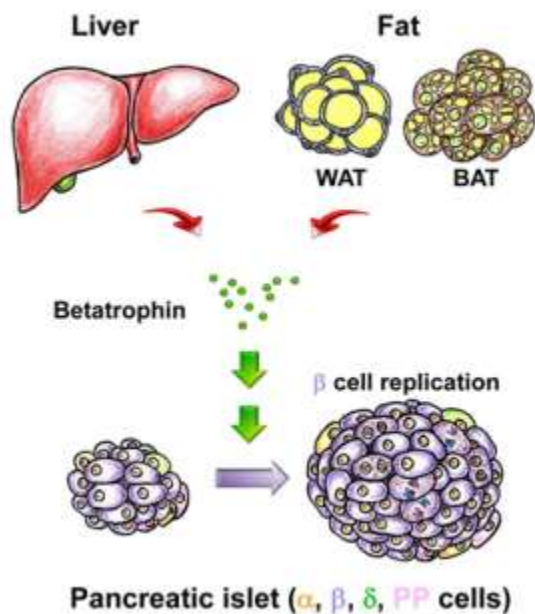
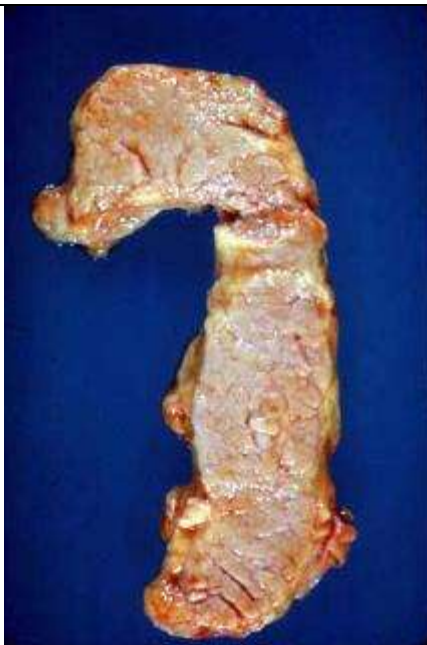


### How do diet and weight contribute to insulin resistance and Type 2 diabetes?



### III - Some predisposing factors

1. **Age:** Any age; average 30—40 years; is more difficult to control in young subjects.
2. **Sex:** Varies; both are affected with varying frequency in various localities.
3. **Race:** More in Hebrews and Eastern races.
4. **Heredity and familial tendencies** (inherited as a modified recessive Mendelian factor); a genetic defect may exist since birth but appears later on (by a precipitating factor). The parents of a juvenile diabetic are usually heterozygous for the disease.
5. **Social:** Obese well-to-do people.
6. **Occupation:** Those who work with mind are more affected than laborers.



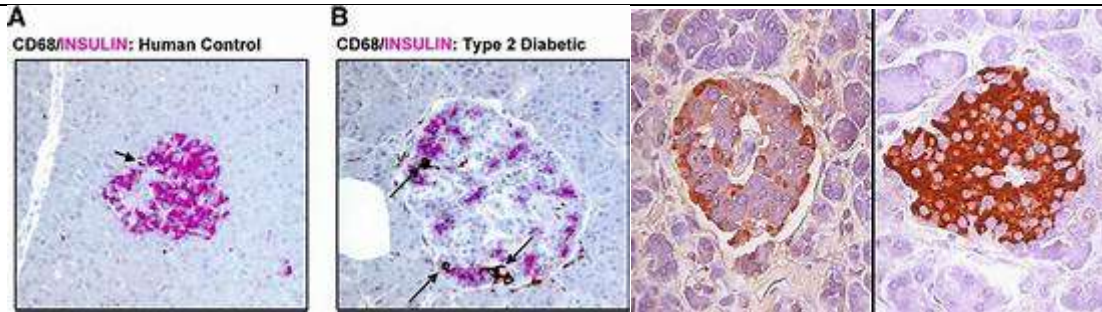
### The pancreas:

#### May grossly appear

- Normal,
- May show diffuse fibrosis, or
- May show a diseased condition (pancreatitis, tumour, cysts, Bilharziasis etc.).

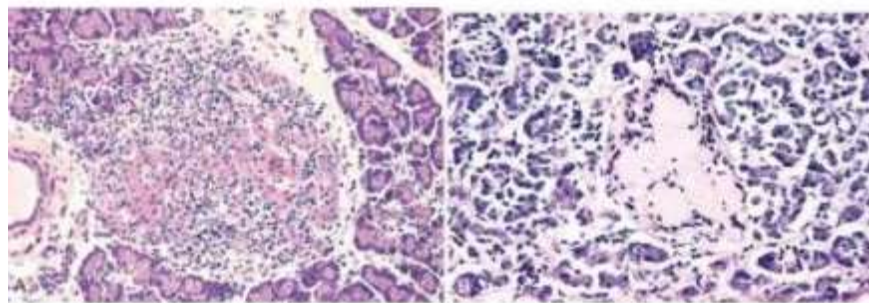
**The other changes (if any) are microscopic**

- Disappearance of granules of beta-cells,
- Hydropic changes,
- Vacuolization of cytoplasm,
- Glycogenic infiltration,
- Fibrosis,
- Amyloidosis and
- Pressure-atrophy,
- Lymphocytic infiltration etc.



**Type-I**

**Type-II**

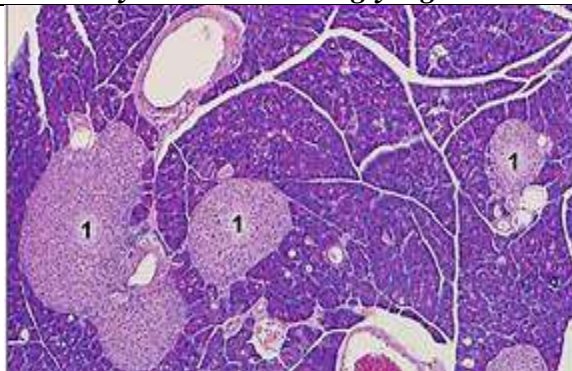


**Insulinitis:**  
Lymphocytic infiltrate within islets.

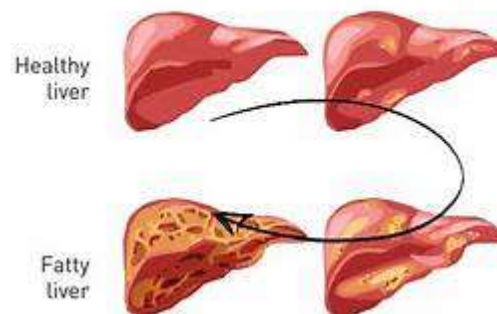
**Islet Hyalinization:**  
Central hyaline deposits replacing  
dead beta cells  
(only in late stage...!)

**The liver:**

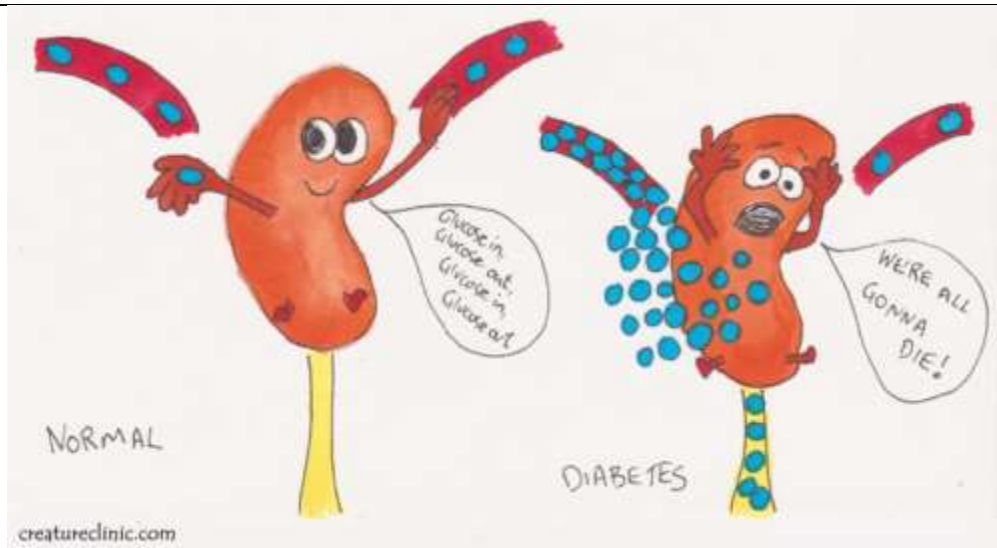
- Fatty change; and, diminish glycogen-storage within the cytoplasm (but, the nuclei may show increased glycogen → clear and glassy).



**Stages of liver damage**





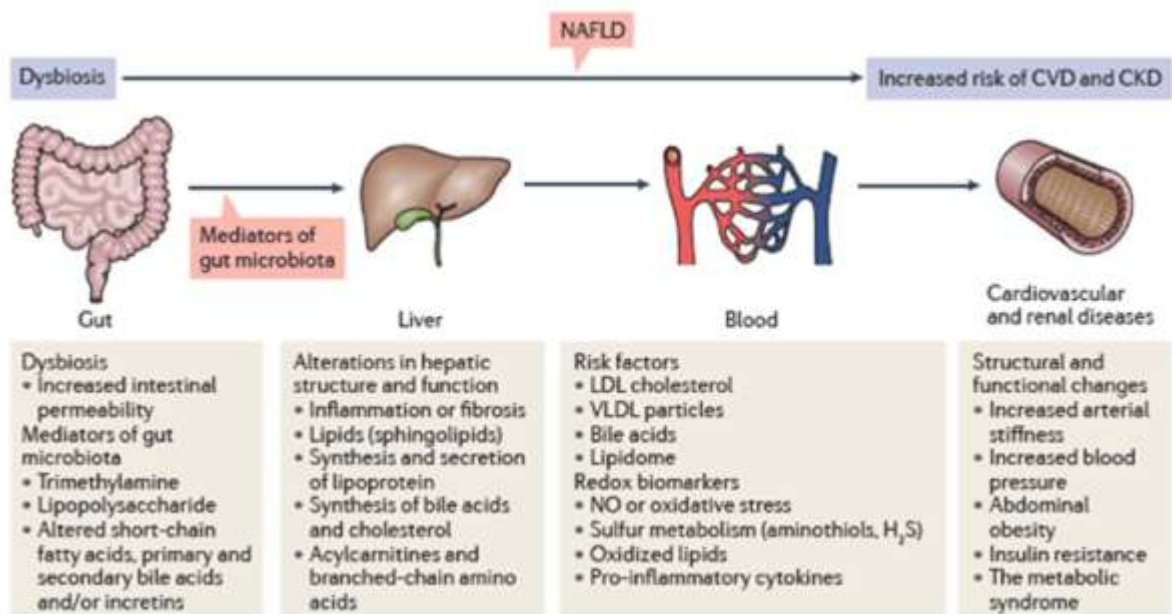


### **Kidneys:**

- *Large, brick-red and may show various lesions such as*
- *Increased glycogen deposition,*
- *Hydropic appearance of cytoplasm,*
- *A hypertensive type of nephrotic syndrome (hypertension, oedema and proteinuria),*
- *Chronic nephritis,*
- *Chronic pyelonephritis (papillary necrosis),*
- *Diabetic intercapillary glomerulonephritis (Kimmelstiel Wilson lesion) and*
- *Arteriosclerosis (papillitis necroticans).*

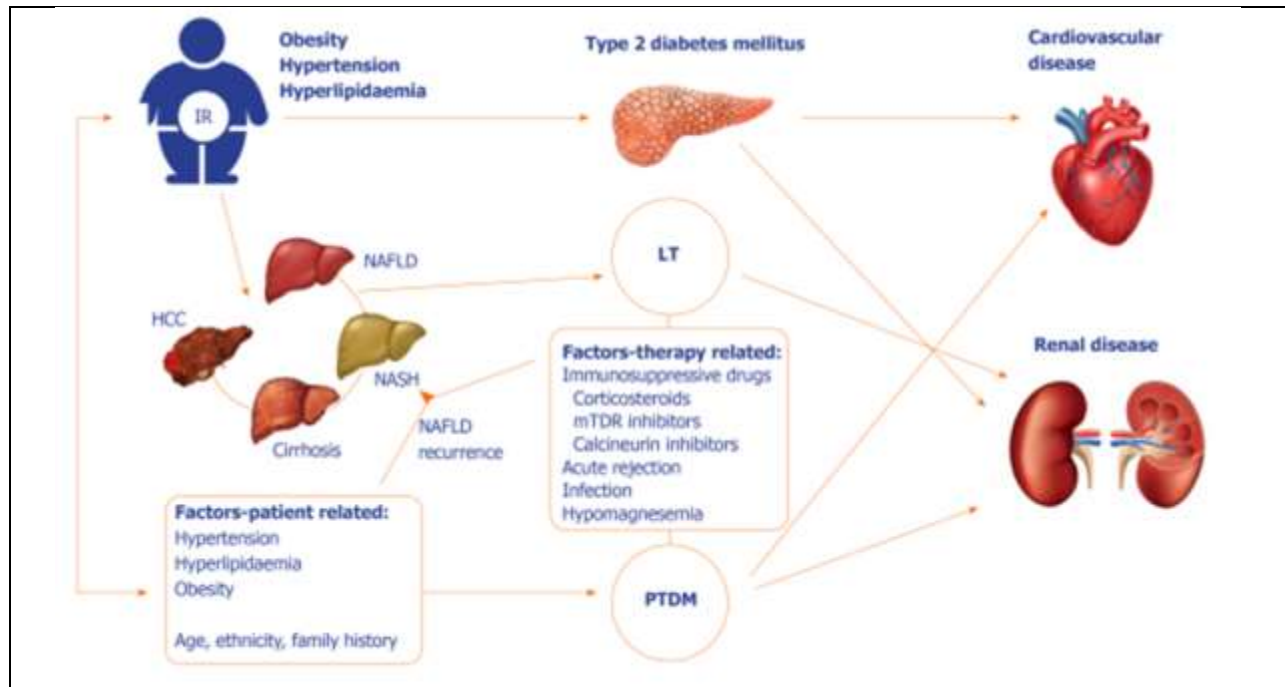
### **The heart:**

- *Deposition of glycogen; myocarditis.*



### **Blood vessels:**

- *Degenerative and proliferative changes in small vessels (atheroma and arteriosclerosis) → coronary artery disease, gangrene, cerebral haemorrhage etc...*



**The blood:**

- *Hyperglycemia (normally the fasting glucose = 80-120 mg./100 c.c.),*
- *Lipemia.*
- *Hypercholesterolemia,*
- *Secondary anaemia,*
- *Leukocytosis (due to stimulation of bone marrow by organic acids) and*
- *Carotenemia (pigment of carrots and vegetables).*

**Eyes:**

- *Diabetic retinopathy (micro-aneurisms of retinal capillaries → haemorrhage and thrombosis), diabetic proliferative retinitis, optic atrophy and cataract (opacity of lens).*

**The reticuloendothelial system and some other tissues:**

- *Storage of lipoids (spleen and liver);*
- *Aorta and blood vessels: show atheromata;*
- *Skin shows xanthoma, xanthoma-multiplex and xanthochromia;*
- *Eye-lids show xanthelasma (palpebrum).*

