

Diabetes Mellitus (Madhumeh)

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Definition: It is a chronic complex metabolic disorder caused by insulin insufficiency/deficiency or impaired insulin action and characterized by glucose intolerance, persistent hyperglycemia and glycosuria.

Epidemiology

- 1) **Species:** Diabetes is commonly found in men, dogs & cats. However, it has also rarely been recorded in cattle, horses, buffalo, sheep and pigs.
- 2) **Age:** Senile dogs are more commonly affected (over 5 years of age). Peak incidence at 8-9 years.
- 3) **Body condition:** Obese animals frequently suffer.
- 4) **Sex:** Bitches are more susceptible than males.

Classification

- 1) **Primary diabetes:** It is due to insulin deficiency.

Type I	Type II
1) Insulin-dependent diabetes mellitus (IDDM)	1) Insulin-independent diabetes mellitus (IIDM)
2) Similar to Juvenile diabetes in human	2) Similar to adult / senile diabetes in human (Maturity on set)
3) Can occur at a young age but is common in Middle-aged and older dogs and cats	3) Common in cats but not well described in dogs
4) Markedly deficient endogenous insulin production	4) Measurable amounts of endogenous insulin present
5) Ketoacidosis is common	5) Ketoacidosis is not common
6) Insulin treatment is always necessary	6) It can be managed in humans with dietary therapy and oral hypoglycemics and weight loss

2) Secondary diabetes

It is due to impaired insulin action. Actually, in this type, there is no insulin deficiency but opposing factors are responsible for hyperglycemia. There is relative insulin deficiency due to decreased sensitivity of receptors to insulin.

i) **Hyperadrenal state:** Prolonged corticosteroid therapy.

ii) **Hyperpituitarism:** Prolonged ACTH therapy.

iii) **Hyperthyroidism:** Thyroid medication.

Etiology

I) Multifactorial disorder:

1) **Genetic predisposition/heredity** – Deficiency in insulin receptor number.

2) **High CHO diet** – It increases insulin requirement.

3) **Drugs like glucocorticoids and Megestrol** – impair insulin action.

4) **Stress of estrous, pseudopregnancy, pregnancy, parturition** – Impaired insulin action.

5) **Immune destruction of beta cells** – Viral infections decreased insulin secretion.

6) **Old age** – decreased sensitivity of receptors to insulin.

7) **Obesity** – decreased sensitivity of receptors to insulin.

8) **No or less exercise** - decreased sensitivity of receptors to insulin.

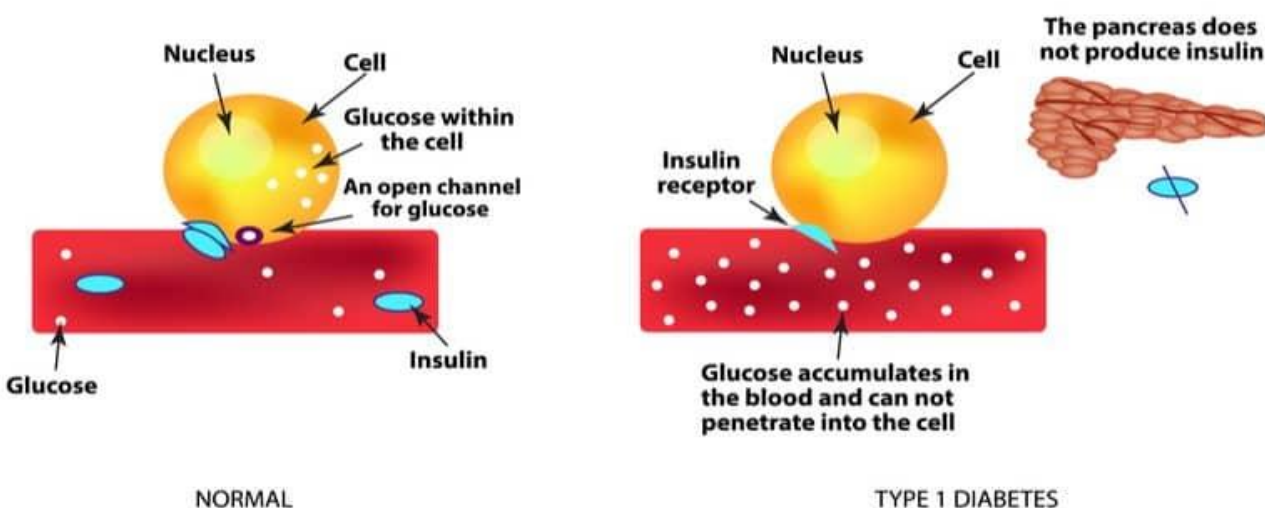
II) Pancreatic disease

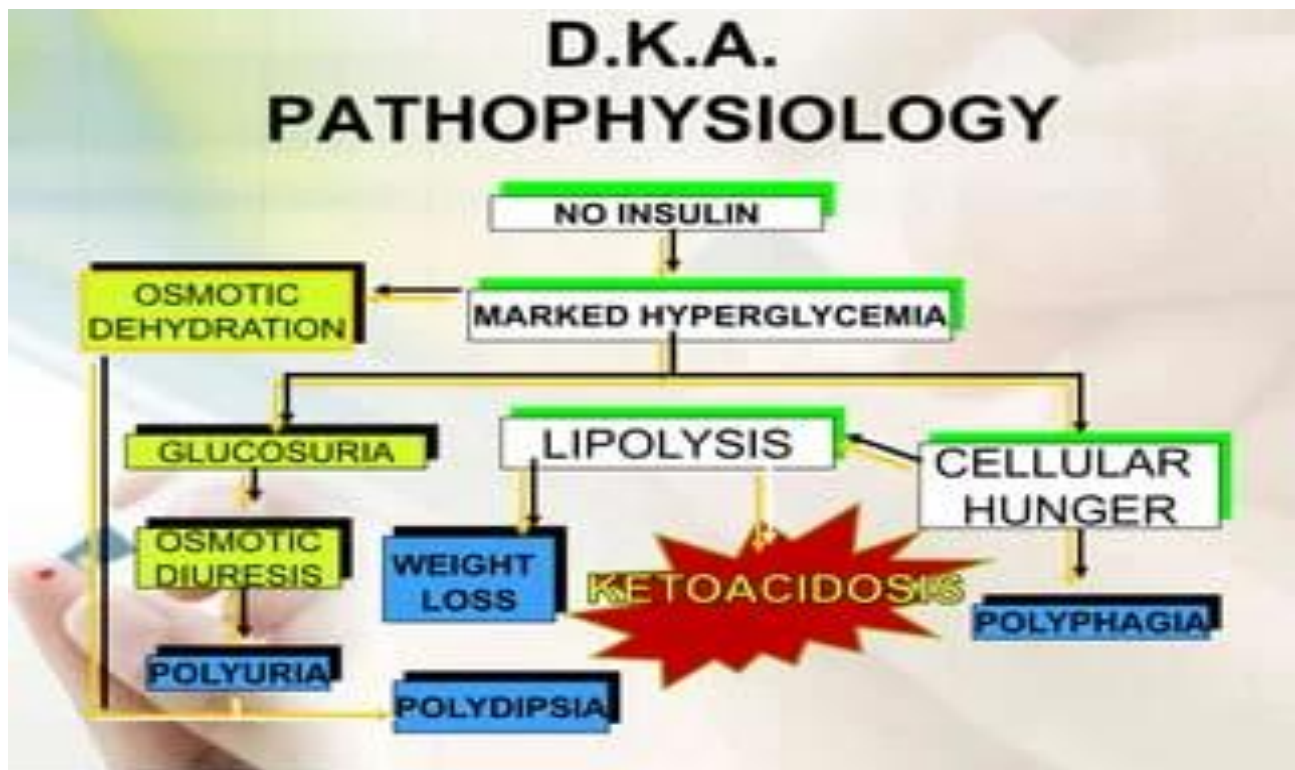
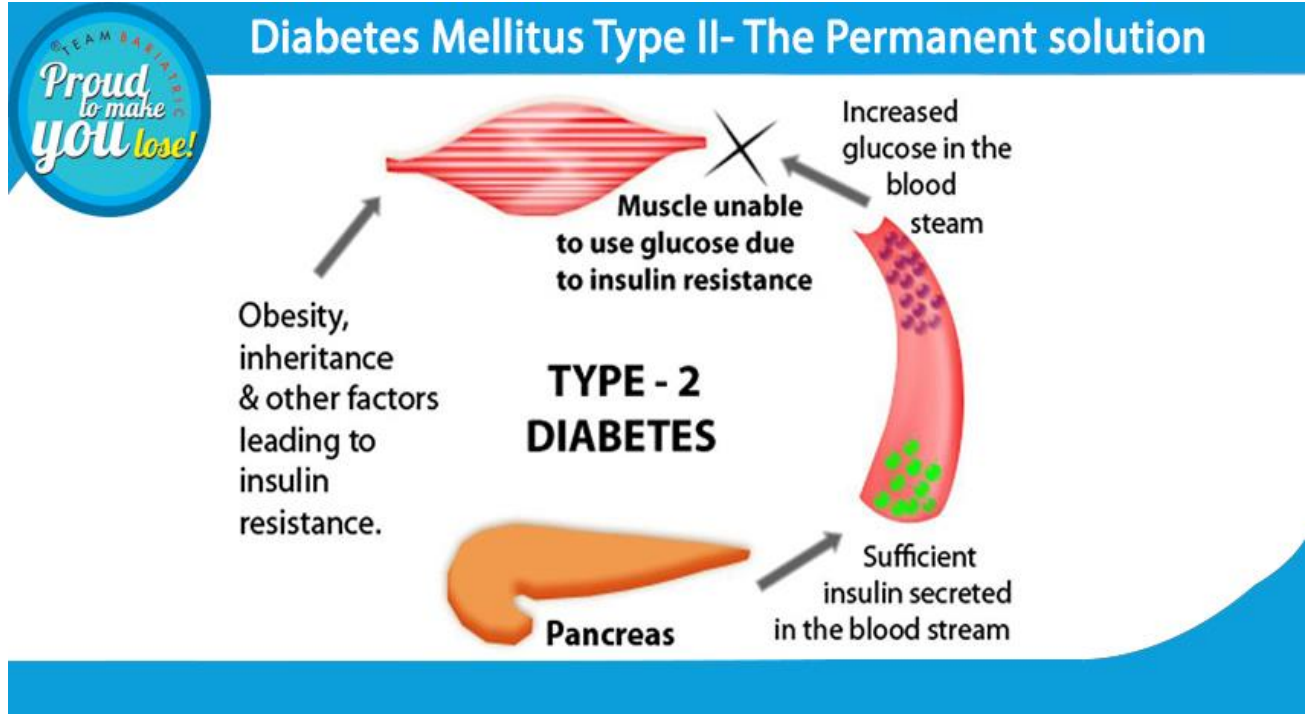
1) Pancreatitis

2) Pancreatic/adrenocortical neoplasms

Pathogenesis

TYPE 1 DIABETES





Clinical signs

- 1) Polydipsia
- 2) Polyuria
- 3) Urine is sticky and sweetish and hence attracts ants.
- 4) Emaciation (rapid) in spite of good appetite occasionally polyphagia.



Complications

- 1) Cataract / corneal opacity.
- 2) Vaginitis (superimposed fungal infection)
- 3) Retinopathy
- 4) Neuropathy
- 5) Nephropathy
- 6) Cardiopathy
- 7) Ketoacidosis
- 8) Delayed wound healing

Diagnosis

- 1) **History:** Heredity, obesity, stress, etc.
- 2) **Clinical signs:** Polyuria and polydipsia.
- 3) **Urine analysis:** increased volume and specific gravity, sustained glycosuria and sometimes ketonuria.
- 4) **Blood biochemistry**
 - a) Sustained hyperglycemia repeated fasting blood glucose > 150 mg /dl and postprandial blood glucose > 200 mg/dl (normal in dogs – 80 to 120 mg/dl)
 - b) Serum urea, cholesterol and ketone bodies are increased diabetes in complicated diabetes mellitus.

Treatment

A) Type – I diabetes

Insulin therapy: It is essential in type I diabetes. Insulin lente / protamine zine (PZI) @ 0.5 U/kg body weight s/c once daily (SID) in a duration of 24 – 36 hours with proper diet regulations. Overdose of insulin may cause Hypoglycemia, vomition, sleepiness and cold extremities.

B) Type II diabetes

Aims of treatment to improve the action of insulin, Reducing the need for insulin, increasing the production of insulin. It is said that diet control, exercise, medication and monitoring are the four pillars of diabetes management.

1) **Diet:** Provide a sugar-free diet low in fat particularly saturated fats and cholesterol so as to reduce the need for insulin. Provide a variety of food cereals, pulses, vegetables and fruits. Feed the dog twice daily – mid-day snacks will help. Reduce calorie intake (Recommended calorie intake for large dogs is 55 kcal / kg body weight whereas for smaller breeds – it is 75 kcal/kg body weight). Give diet to maintain healthy body weight and weight loss is one way to lower blood glucose, especially in patients with type II diabetes.

2) **Exercise:** Give regular exercise which improves blood glucose control and increases the sensitivity of receptors to insulin.

3) **Oral hypoglycemics:** They are used in humans with type II diabetes but are uncommonly used in veterinary medicine. They are indicated in maturity onset, nonketotic-prediabetes. They are not used in type I or juvenile



or ketoacidosis-prone diabetes. e.g., Tolbutamide (0.5 gm tab) @ 0.5 – 3 gm orally every 6-12 hours and Phenformin (25 mg tab) @ 50 – 200 mg orally every 4-6 hours.

4) Monitoring: Regular urine analysis and blood glucose analysis.

In case of Complicated diabetes mellitus If glycosuria is more than 1%, Ultrashort acting insulin @ 1 IU/kg and saline, less than 1%, 5% dextrose, course of antibiotics are needed. Administration of 1.25% Sodium bicarbonate solution to overcome ketoacidosis.

Control of diabetes

It includes Freedom from symptoms, Bring the weight to normal because being overweight causes resistance to insulin. Bringing blood glucose to normal and controlling blood glucose is very important to prevent complications of diabetes. Control blood lipids (cholesterol).

