

Endocrine & Metabolic Drugs

1. Diabetes Medications

Mechanism of Action (MOA):

Insulin

- **Rapid-Acting** (e.g., Lispro, Aspart, Glulisine):
 - Onset: ~15 minutes, Peak: 30-90 minutes, Duration: 3-5 hours.
 - Mimics prandial insulin secretion for meal-time glucose control.
- **Short-Acting** (e.g., Regular Insulin):
 - Onset: ~30 minutes, Peak: 2-4 hours, Duration: 5-8 hours.
 - Used for meal-time glucose control and IV insulin therapy.
- **Intermediate-Acting** (e.g., NPH Insulin):
 - Onset: 1-2 hours, Peak: 4-12 hours, Duration: 12-18 hours.
 - Provides basal insulin coverage but has variable absorption.
- **Long-Acting** (e.g., Glargine, Detemir, Degludec):
 - Glargine: Onset: 1-2 hours, No significant peak, Duration: ~24 hours.
 - Detemir: Onset: 1-2 hours, Peak: ~6-8 hours, Duration: ~24 hours.
 - Degludec: Ultra-long duration (>42 hours), providing stable basal control.
- **Mixed Insulin** (e.g., 70/30 NPH/Regular, 50/50, 75/25 Lispro Protamine/Lispro):
 - Combination of basal and prandial insulins for simplified regimens.

Biguanides (e.g., Metformin):

- Decreases hepatic gluconeogenesis.
- Increases peripheral glucose uptake and insulin sensitivity.
- Does not cause hypoglycemia.

Sulfonylureas (e.g., Glipizide, Glyburide, Glimepiride):

- Stimulates insulin release from pancreatic beta cells by closing ATP-sensitive K⁺ channels.
- Can cause hypoglycemia and weight gain.

Meglitinides (e.g., Repaglinide, Nateglinide):

- Similar to sulfonylureas but with shorter action.
- Rapid onset and useful for postprandial glucose control.

Thiazolidinediones (TZDs)

(e.g., Pioglitazone, Rosiglitazone):

- Activate PPAR- γ to improve insulin sensitivity.
- Increase glucose uptake in muscle and adipose tissue.
- Can cause weight gain, edema, and increased risk of heart failure.

DPP-4 Inhibitors (e.g., Sitagliptin, Linagliptin,

Saxagliptin):

- Inhibit DPP-4 enzyme, prolonging incretin action.
- Increase insulin secretion and reduce glucagon levels.
- Generally weight neutral.

GLP-1 Receptor Agonists (e.g., Liraglutide,

Exenatide, Dulaglutide, Semaglutide):

- Mimic incretin hormones to increase insulin secretion and delay gastric emptying.
- Promote weight loss and reduce cardiovascular risk.
- Can cause nausea and pancreatitis.

SGLT2 Inhibitors (e.g., Empagliflozin, Canagliflozin,

Dapagliflozin):

- Inhibit sodium-glucose co-transporter 2 (SGLT2) in the kidneys.
- Increase urinary glucose excretion, leading to lower blood glucose levels.
- Associated with weight loss and reduced cardiovascular risk.
- Risk of UTIs, dehydration, and ketoacidosis.

Important Side Effects (SE):

- **Hypoglycemia** (Sulfonylureas, Insulin, Meglitinides).
- **Weight gain** (Insulin, Sulfonylureas, TZDs).
- **Gastrointestinal effects** (GLP-1 agonists, Metformin).
- **Fluid retention and heart failure** (TZDs).
- **Genital infections and UTIs** (SGLT2 inhibitors).

Key Notes:

- Metformin is first-line therapy for Type 2 diabetes unless contraindicated.
- Insulin therapy is required for Type 1 diabetes.
- GLP-1 agonists and SGLT2 inhibitors have additional cardiovascular benefits.
- Monitor renal function for Metformin, SGLT2 inhibitors, and DPP-4 inhibitors.

2. Thyroid Hormones

Mechanism of Action (MOA):

Levothyroxine (T4) & Liothyronine (T3):

- Act as synthetic thyroid hormones to replace deficient thyroid function.
- Increase basal metabolic rate and oxygen consumption.
- Essential for growth, metabolism, and CNS development.

Thionamides (e.g., Methimazole, Propylthiouracil/PTU):

- Inhibit thyroid peroxidase, blocking thyroid hormone synthesis.
- PTU also inhibits peripheral conversion of T4 to T3.
- Used for hyperthyroidism.

Iodine Solution (Lugol's solution, Potassium Iodide):

- Inhibits thyroid hormone release in thyrotoxicosis.
- Preoperative preparation for thyroidectomy.

Radioactive Iodine (I-131):

- Selectively destroys thyroid tissue.
- Used for Graves' disease and thyroid cancer.

Important Side Effects (SE):

- **Levothyroxine:** Hyperthyroidism symptoms (palpitations, weight loss, tremors, heat intolerance).
- **Thionamides:** Agranulocytosis, hepatotoxicity (PTU), rash.
- **Radioactive Iodine:** Hypothyroidism post-treatment.
- **Iodine solutions:** Hypersensitivity reactions, iodine-induced hyperthyroidism.

Key Notes:

- **Levothyroxine is the treatment of choice for hypothyroidism** and should be taken on an empty stomach.
 - **Methimazole is preferred over PTU** due to lower hepatotoxicity risk, except in the first trimester of pregnancy.
 - **Monitor TSH and T4 levels regularly** to adjust dosing.
-

3. Corticosteroids

Mechanism of Action (MOA):

Glucocorticoids (e.g., Hydrocortisone, Prednisone, Dexamethasone):

- Bind to intracellular glucocorticoid receptors, altering gene expression.
- Suppress inflammation, immune responses, and metabolic functions.
- Increase gluconeogenesis and reduce insulin sensitivity.

Mineralocorticoids (e.g., Fludrocortisone):

- Enhance sodium retention and potassium excretion via aldosterone receptors.
- Used for adrenal insufficiency (Addison's disease).