

### **Types of Insulin Classification Examples\***

**Rapid-acting insulin** lispro (Humalog) aspart (NovoLog) glulisine (Apidra)

**Short-acting insulin** regular (Humulin R, Novolin R)

**Intermediate-acting insulin** NPH (Humulin N, Novolin N)

**Long-acting insulin** glargine (Lantus) detemir (Levemir) degludec (Tresiba)

**Combination therapy (premixed)** NPH/regular 70/30† (Humulin 70/30, Novolin 70/30) NPH/regular 50/50† (Humulin 50/50) lispro protamine/lispro 75/25† (Humalog Mix 75/25) lispro protamine/lispro 50/50† (Humalog Mix 50/50) aspart protamine/aspart 70/30† (NovoLog Mix 70/30) degludec/aspart 70/30 (Ryzodeg)

**More concentrated insulin** Toujeo U-300 (insulin glargine) Humulin R U-500 Inhaled insulin Afrezza

### **Oral Agents and Noninsulin Injectable Agents Type Mechanism of Action Side Effects Oral Agents**

**Biguanides** metformin (Glucophage, Glucophage XR, Riomet, Fortamet, Glumetza) Decreases rate of hepatic glucose production. Augments glucose uptake by tissues, especially muscles. Diarrhea, lactic acidosis. Must be held 1-2 days before IV contrast media given and for 48 hr after.

**Sulfonylureas** glipizide (Glucotrol, Glucotrol XL) glyburide (DiaBeta, Glynase) glimepiride (Amaryl) Stimulate release of insulin from pancreatic islets. Decrease glycogenolysis and gluconeogenesis. Enhance cellular sensitivity to insulin. Weight gain, hypoglycemia.

**Meglitinides** nateglinide (Starlix) repaglinide (Prandin) Stimulate a rapid and short-lived release of insulin from the pancreas. Weight gain, hypoglycemia.

**$\alpha$ -Glucosidase Inhibitors** acarbose (Precose) miglitol (Glyset) Delay absorption of complex carbohydrates (starches) from GI tract. Gas, abdominal pain, diarrhea.

**Thiazolidinediones** pioglitazone (Actos) rosiglitazone (Avandia) Increase glucose uptake in muscle. Decrease endogenous glucose production. Weight gain, edema. pioglitazone: may increase risk for bladder cancer and exacerbate heart failure. rosiglitazone: may increase risk for cardiovascular events (e.g., myocardial infarction, stroke).

**Dipeptidyl Peptidase-4 (DPP-4) Inhibitors** linagliptin (Tradjenta) saxagliptin (Onglyza) sitagliptin (Januvia) alogliptin (Nesina) Enhance activity of incretins. Stimulate release of insulin from pancreatic  $\beta$ -cells. Decrease hepatic glucose production. Pancreatitis, allergic reactions.

**Dopamine Receptor Agonists** bromocriptine (Cycloset) Activates dopamine receptors in central nervous system. Unknown how it improves glycemic levels. Orthostatic hypotension.

**Sodium-Glucose Co-Transporter 2 (SGLT2) Inhibitors** canagliflozin (Invokana) dapagliflozin (Farxiga) empagliflozin (Jardiance) Decreases renal glucose reabsorption and increases urinary glucose excretion Increased risk of genital and urinary tract infections. Hypoglycemia.

**Combination Oral Therapy** Glucovance Same as for metformin and glyburide. See side effects for individual drugs. Duetact Same as for pioglitazone and glimepiride. Same as above. Actoplus Met, Actoplus Met XR Same as for metformin and pioglitazone. Same as above. Janumet, Janumet XR Same as for metformin and sitagliptin. Same as above. Jentadueto Same as for linagliptin and metformin. Same as above. PrandiMet Same as for metformin and repaglinide. Same as above. Kombiglyze Same as for saxagliptin and metformin. Same as above. Kazano Same as for alogliptin and metformin. Same as above. Oseni Same as for alogliptin and pioglitazone. Same as above. Glyxambi Same as for empagliflozin and linagliptin. Same as above. Xigduo Same as for dapagliflozin and metformin. Same as above. Synjardy Same as metformin and empagliflozin. Same as above.

**Noninsulin Injectable Agents** Glucagon-Like Peptide-1 (GLP-1) Receptor Agonists\* exenatide (Byetta) exenatide extended-release (Bydureon) liraglutide (Victoza) albiglutide (Tanzeum) dulaglutide (Trulicity) lixisenatide (Adlyxin) Stimulate release of insulin, decrease glucagon secretion, and slow gastric emptying. Increase satiety. Nausea, vomiting, hypoglycemia, diarrhea, headache.

**Amylin Analogs**† pramlintide (Symlin) Slows gastric emptying, decreases glucagon secretion and endogenous glucose output from liver. Increases satiety. Hypoglycemia, nausea, vomiting, decreased appetite, headache.

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