

# Non-insulin Diabetes Medicines

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## Purpose

This section is intended to provide information on the purpose, action, use, and side effects of non-insulin diabetes medicines, both oral and injectable.


## Objectives

**At the end of this section, you will be able to:**

- Define the purpose of oral diabetes medicines.
- State the name of your diabetes medicine, the dose, and the time it should be taken.
- Identify the action of the oral diabetes medicines you take.
- Describe one potential side effect of your diabetes medicine.
- Identify the role of non-insulin injectable medicines in diabetes management.
- Identify one way to remember to take your medicine.

## Outline

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 <b>American Diabetes Association®</b>	*The American Diabetes Association Recognizes this education service as meeting the National Standards for Diabetes Self-Management Education and Support.
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# Oral diabetes medicines

## What do oral diabetes medicines do?

- Diabetes medicines lower blood glucose levels; these medicines work with your meal and exercise plan to lower your blood glucose levels.
- Different types of medicine work differently; see “Types of diabetes medicines” N-5 for more information.
- Check with your health care provider or pharmacist for the side effects (potential problems) of the medicine you are taking; report any side effects to your health care provider immediately.



## What if I miss a dose (or miss taking) my medicine?

- Different types of diabetes medicines have different recommendations; check with your health care provider for your specific directions.
- Taking your medicine at the same time each day will help you to remember; some people use other methods to help them remember such as marking your calendar after you take the medicine, using a daily pillbox, or putting a note on the refrigerator.

**HINT:** To avoid running out of medicines, know when your prescription runs out as well as how many refills you have left. If you need to get a renewal on a prescription, allow at least 48 hours for the process. If your medicines are mailed to you, you will need to allow at least a week or two.

## Do I take my pill if I am sick?

- If you are sick and cannot eat, generally, you still must take your medicine.
- Follow the instructions provided by your health care provider for your sick days; also see “Sick Day Guidelines” in the “Acute Complications” page J-16.

## Can I drink alcohol with my medicine?

- Most medicines and alcohol do not mix.
- Check with your health care provider or pharmacist before you drink alcohol while on medicine.

## Do I take my medicine if I am fasting for lab work?

- Generally, it is recommended that diabetes medicines be taken after you have completed the lab work and are allowed to eat.
- Check with your health care provider for recommendations for you.

# Should I take diabetes medicines if I am pregnant, planning on getting pregnant, or breastfeeding?

- Talk with your health care provider if you are planning on getting pregnant to create a treatment plan that is safe for your baby.
- Some oral medicines are not recommended during pregnancy and need to be changed to a different, safer medicine.

## How do I store my medicines?

- Store your oral diabetes medicines at room temperature; the bathroom medicine cabinet is NOT recommended because higher humidity may damage the medicine.
- Never use your medicines once they are past the expiration date.
- If your medicines become discolored, do not take them. Call your pharmacist for assistance.

## What should I do if I notice my blood glucose levels are changing from my normal patterns?

- A change in your blood glucose levels can be related to many different things, such as illness, a change in diet, or a change in your exercise level.
- Review your meal plan and check portion sizes.
- Do a control test on your blood glucose meter to check its accuracy.
- If blood glucose levels are consistently higher than usual or if you are having low blood sugars, contact your diabetes educator or health care provider.
- Sometimes the dose or type of medicine may need to be changed.

## Types of oral diabetes medicines

- Oral diabetes medicines are divided into classes.
- Each class works differently in the body to help control blood glucose.
- The classes of oral diabetes medicines are:
  - Biguanides (metformin)
  - Sulfonylureas
  - Meglitinides
  - Sodium - glucose co-transporter 2 inhibitors (SGLT2) inhibitors
  - GLP1
  - Dipeptidyl peptidase 4 (DPP-4) inhibitors
  - Alpha-glucosidase inhibitors
  - Thiazolidinediones (TZD's)
- Most patients need to take more than one class of diabetes medicines.
- Ask your diabetes educator for information sheets specific to your diabetes medicines, so you are aware of all possible side effects.

**Note:** The following medicine charts may not contain all available medicines or possible side effects. For more information talk to your pharmacist.

## Biguanides (metformin)

These medicines decrease the release of glucose by the liver and cause the cells to be more sensitive to insulin.

**Special note:** This medicine may re-establish ovulation and the chance of pregnancy in pre-menopausal women with irregular periods.

**Possible side effects:** Include abdominal cramping and/or diarrhea. Taking biguanides with food can decrease these side effects. It is common to start at lower doses and increase the medicine dose as tolerated. If you experience severe nausea, vomiting, stomach pain, diarrhea, dizziness, muscle pain, shortness of breath, or irregular heartbeat call your doctor immediately.

Generic	Brand Name	Daily Dosage Ranges	Notes
Metformin	Glucophage®	500 - 2550 mg	2 or 3 times a day with a meal
Metformin XR (extended release)	Glucophage XR® Glumetza®	500 - 2000 mg	1 or 2 times a day with a meal Do not break pill
Metformin (extended release)	Fortamet®	500 - 2500 mg	Take with a meal
Metformin (liquid) 500 mg/5mL	Riomet®	5 - 25.5 ml or 500 - 2550 mg	2 or 3 times a day with a meal

If you are having surgery (including dental) or an X-ray procedure requiring injection of dye; discuss when and how long to hold your metformin with your health care provider.

## Sulfonylureas

These sulfa-based medicines stimulate the pancreas to release more insulin.

**Special note:** A recent European study revealed that glyburide is associated with higher risk of death in patients with heart disease as compared to other drugs in its group. It is therefore recommended to use glimepiride or glipizide.

**Possible side effects:** These medicines can cause hypoglycemia (low blood sugar). Be sure to carry fast-acting carbohydrates when leaving home to treat low blood glucose if necessary. Check your blood glucose before driving. These medicines may cause sun sensitivity.

Generic	Brand Name	Daily Dosage Ranges	Notes
Glipizide	Glucotrol®	2.5 - 40 mg	1 or 2 times a day Take 30 minutes before a meal
	Glucotrol XL®	2.5 - 20 mg	Usually 1 time a day with a meal Do not break pill
Glimepiride	Amaryl®	1 - 8 mg	Usually just once daily Take with a meal
Glyburide	Not available	1.25 - 20 mg	1 or 2 times a day with a meal

## Meglitinides

These medicines cause the pancreas to release insulin over a short period of time. They can cause hypoglycemia. Be sure to carry fast-acting carbohydrates to treat low blood glucose. Check your blood glucose before driving. Do not take without food or if dose is missed.

Generic	Brand Name	Daily Dosage Ranges	Notes
Repaglinide	Prandin®	0.5 - 16 mg	Take between 1 and 30 minutes before a meal; 1 to 4 times a day
Nateglinide	Starlix®	60 - 360 mg	Take between 1 and 30 minutes before a meal; works best just before the meal; 1 to 4 times a day

## Sodium-glucose co-transporter 2 inhibitors (SGLT 2)

This group of medicines lowers blood glucose by allowing more glucose to be eliminated in the urine.

**Possible side effects:** Include urinary tract/bladder infections, genital infections, more frequent urination and symptoms of low blood pressure such as dizziness or light-headedness upon standing. Contact your doctor if you experience any of these symptoms. Some of these drugs may decrease the risk of heart disease in those at high risk.

Generic	Brand Name	Daily Dosage Ranges	Notes
Canagliflozin	Invokana®	100 - 300 mg	Take 1 a day, before the first meal of the day
Dapagliflozin	Farxiga®	5 - 10 mg	Take 1 a day in the morning, with or without food
Empagliflozin	Jardiance®	10 - 25 mg	Take 1 a day in the morning, with or without food
Ertugliflozin	Steglatro	5 - 15 mg	Take 1 time a day with or without food.

## GLP-1 Agonists (incretin mimetics)

These medicines are a form of an intestinal hormone glucagon-like peptide (GLP-1), which has a glucose-lowering effect. They slow the rate of stomach emptying giving a long lasting feeling of fullness, and slow the rise in blood glucose levels. In addition, they prevent the liver from releasing glucose after meals and increase the production of insulin by the pancreas during mealtime when glucose levels rise.

Possible side effects:

- Nausea and or vomiting may occur because the stomach empties slower. The medicine is usually started at a lower dose and gradually increased over a period of time. Eating immediately after taking the medicine may prevent or decrease the severity of nausea.
- Hypoglycemia may occur if these medicines are used in combination with a sulfonylurea or meglitinide or insulin. Always carry a fast-acting carbohydrate to treat low blood glucose. Check your glucose before driving.
- Slower stomach emptying increases a sense of fullness resulting in fewer calories being eaten and weight loss.
- Acute pancreatitis is a rare but serious side effect. Seek medical care immediately if you experience constant, unexplained severe abdominal pain with or without vomiting.
- Do not use if family or personal history of medullary thyroid cancer.

Generic	Brand Name	Daily Dosage Ranges	Notes
Semaglutide oral tablets	Rybelsus®	3 mg - 14 mg	Administer at least 30 minutes before the first food, beverage, or other medications of the day with no more than 4 oz of plain water only.

(The 3 mg starting dose is intended to reduce side effects, and it does not provide effective blood sugar control.)

## DPP-4 Inhibitors

This group of medicines work only when blood glucose levels are high and usually do not cause hypoglycemia.

The DPP-4 inhibitor medicines block some of the DPP-4 enzyme activity, allowing GLP1 levels to increase which in turn increases the body's own insulin and controls diabetes.

**Possible side effects:** Upper respiratory tract infection, sore throat, headache, stomach upset, and diarrhea.

Generic	Brand Name	Daily Dosage Ranges	Notes
Alogliptin	Nesina®	25 mg	Take 1 time a day with or without food
Sitagliptin	Januvia™	25 - 100 mg once a day	Take 1 time a day with or without food
Saxagliptin	Onglyza®	2.5 - 5 mg a day	Take 1 time a day with or without food
Linagliptin	Tradjenta™	5 mg a day	Take 1 time a day with or without food

## Alpha Glucosidase Inhibitors

These medicines block or slow the breakdown and absorption of carbohydrates. They last for two hours so they must be taken with meals. Do not take without food or if dose is missed.

**Possible side effects:** Intestinal gas and bloating.

Generic	Brand Name	Daily Dosage Ranges	Notes
Acarbose	Not available	25 - 300 mg	Take with first bite of a meal; 3 times a day
Miglitol	Glyset®	25 - 300 mg	Take with first bite of a meal; 3 times a day

## Thiazolidinediones (TZD)

These medicines cause the cells to be more sensitive to insulin. They also decrease the release of glucose by the liver.

**Special note:** This medicine may re-establish ovulation and the chance of pregnancy in pre-menopausal women with irregular periods. Pioglitazone has been linked to an increased risk of bladder cancer.

**Possible side effects:** Include a slow weight gain, fluid retention, and an increased risk of certain heart diseases. They may contribute to bone loss in some postmenopausal women. Keep regular visits with your health care provider.

Generic	Brand Name	Daily Dosage Ranges	Notes
Pioglitazone	Actos®	15 - 45 mg	1 a day
Rosiglitazone	Avandia®	2 - 8 mg	1 or 2 times a day with a meal



# Mixture medicines

## Combination medicines

Combination medicines are just what they imply – two diabetes medicines in one pill. For example, a combination of glipizide and metformin is called Metaglip, or may be listed as glipizide/metformin on the medication label.

Convenience and cost are two good reasons to switch to a combination pill. Insurance companies charge a copay for each prescription received. Combination pills require just one copay, even though you are getting two medicines.

Most combination pills have only a few options for dosing. This may make it more difficult for your physician to adjust your dose. You may need to switch back to two pills if the dose recommended by your doctor is not available.

With combination medicines, if you have side effects, it may be difficult to determine which medication causes them.

Talk to your doctor and pharmacist if you are interested in a combination medicine.

## Non-insulin injectable diabetes medicines

### Incretin mimetics

These medicines are a form of an intestinal hormone glucagon-like peptide (GLP-1), which has a glucose lowering effect. They slow the rate of stomach emptying giving a long lasting feeling of fullness, and slow the rise in blood glucose levels. In addition, they prevent the liver from releasing glucose after meals and increase the production of insulin by the pancreas during mealtime when glucose levels rise.

#### Possible side effects:

- Nausea and or vomiting may occur because the stomach empties slower. The medicine is usually started at a lower dose and gradually increased over a period of time. Eating immediately after taking the medicine may prevent or decrease the severity of nausea.
- Hypoglycemia may occur if these medicines are used in combination with a sulfonylurea or meglitinide or insulin. Always carry a fast-acting carbohydrate to treat low blood glucose. Check your glucose before driving.
- Slower stomach emptying increases a sense of fullness resulting in fewer calories being eaten and weight loss.
- Acute pancreatitis is a rare but serious side effect. Seek medical care immediately if you experience constant, unexplained severe abdominal pain with or without vomiting.
- Do not use if family or personal history of medullary thyroid cancer.

Generic	Brand Name	Daily Dosage Ranges	Notes
Exenatide	Byetta®	5 mcg - 10 mcg twice a day	Inject between 5 and 60 minutes before morning and evening meals. If you forget and have started eating, skip that dose.
Exenatide (extended release)	Bydureon® and Bydureon® BCise™	2 mg once weekly	Inject once weekly at any time of the day, with or without a meal.
Liraglutide	Victoza®	0.6 mg to 1.8 mg a day	Inject once a day with or without meal.
Dulaglutide	Trulicity®	0.75 mg - 1.5 mg once weekly	Inject once weekly at any time of the day, with or without a meal.
Lixisenatide	Adlyxin®	10 mcg - 20 mcg once daily	Inject once daily within one hour before the first meal.
Semaglutide	Ozempic®	0.25 mg - 1 mg once weekly	Inject once a day, with or without a meal
Semaglutide oral tablets	Rybelsus®	3 mg - 14 mg once daily	Administer at least 30 minutes before the first food, beverage, or other medications of the day with no more than 4 oz of plain water only.

- Oral antibiotics and contraceptives should be taken 1 hour before these injectable medicines.
- Inject into abdomen, thighs, or arms.
- Do not freeze. Refrigerate unopened medicine until expiration date on label. Opened medicine can be kept at room temperature and expires in 30 days.

**Do not use**

- If Byetta or Bydureon pen is exposed to temperature 77° F or more, the medicine is not as potent - replace it.
- If Victoza, Trulicity, or Adlyxin pen is exposed to temperature 86° F or more, the medicine is not as potent - replace it.
- If pregnant or breast-feeding



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## Amylin mimetics

This injectable medicine is a man-made form of hormone called amylin. When the pancreas makes too little insulin, it also makes too little amylin. This is found in both type 1 and type 2 diabetes.

Amylin helps slow the rate that food moves through the stomach and intestine and then slows the rise of blood glucose levels following meals. It restricts the glucose released by the liver during meals and decreases your appetite, causing you to eat less calories which helps with weight loss.

**Possible side effects:** nausea and or vomiting, which is related to the delay in stomach emptying. Starting at a lower dose and gradually increasing as tolerated will decrease these symptoms. Hypoglycemia can occur. Insulin doses are usually decreased when starting this medicine. Glucose monitoring is essential and results need to be reported to your provider regularly to avoid severe hypoglycemia. Carry fast-acting carbohydrates to treat low blood glucose. Remember to check your blood glucose before driving.

Generic	Brand Name	Daily Dosage Ranges	Notes
Pramlintide Acetate	Symlin®	Type 1 - 15 mcg injected just before major meal  Type 2 - 60 mcg injected just before major meal	Must be warmed to room temperature before injecting. Major meal must be 250 calories or more or 30 gm or more carbohydrate. Do not mix into insulin. Do not inject into arms; use abdomen or legs. Do not freeze. Refrigerate unopened medicine until expiration date on label. Opened medicine expires in 28 days.
<b>Available in prefilled pens.</b>			