

medications for type 2 diabetes

People with type 2 diabetes are often given medications including insulin to help manage their blood glucose levels. Most of these medications are in the form of tablets, but some are given by injection. These tablets or injections are intended to be used together with healthy eating and regular physical activity, not as a substitute. Diabetes tablets are not an oral form of insulin and with recent drug developments, not all injectable medications are insulin. Occasionally side effects can occur with medications. Speak with your doctor or pharmacist if you experience any problems. An alternative medication is usually available.

Classes of medications

Currently there are five classes of tablets and two classes of injections used in Australia for lowering blood glucose levels. The classes of tablets are known as biguanides, sulphonylureas, thiazolidinediones (glitazones), alpha glucosidase inhibitors (acarbose) and DPP-4 inhibitors. The two classes of medications given by injection are incretin mimetics and insulin. The following provides an overview of the current types (brands) within the different classes. Brands may vary as new medications become available.

1. Biguanides (metformin)

Chemical name *Some brand names*

METFORMIN Apo-metformin, Diabex, Diabex XR*, Diaformin, Diaformin XR*, Formet, Genepharm metformin, Genrx metformin, Glucobete, Glucomet, Glucophage, Metex XR*, Metforbell, Metformin GA, Metformin (Generic Health), Metformin (Ranbaxy), Metformin (Sandoz), Pharmacor metformin

- They help to lower blood glucose levels by:
 - > reducing the amount of stored glucose released by the liver
 - > slowing the absorption of glucose from the gut (intestine)
 - > helping the body to become more sensitive to insulin so that your own insulin works better.
- Side effects can include nausea, diarrhoea and a metallic taste in the mouth.
- To reduce side effects, tablets should be taken with or after a meal.
- They need to be started at a low dose and increased slowly.

* Extended release

It can be helpful for people with type 2 diabetes to regularly check their glucose levels at home. If taking tablets, this helps to know if they are having the desired effect. Regular checking of blood glucose levels for those taking insulin is always recommended.



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- Metformin has been shown to reduce the overall death rate of people with type 2 diabetes more than by the effect it has on blood glucose levels. This is why metformin is often considered to be the first choice medication in management of type 2 diabetes. It can be beneficial for people with type 2 diabetes to check their glucose levels at home on a regular basis. When taking tablets, you may need to check your glucose levels more often to ensure your medication is having the desired effect. Checking blood glucose regularly is always recommended when taking insulin.
- Metformin is often prescribed as the first diabetes tablet for people with type 2 diabetes who are overweight. It generally doesn't lead to weight gain and may help to manage weight.
- Metformin should not be used by people with severe liver, kidney or heart disease.
- Metformin may need to be stopped before and immediately after surgery or procedures that require a radio-opaque dye such as a coronary angiogram. Always check with your doctor.
- It is rarely prescribed for women who are pregnant or breast-feeding.
- Type 2 diabetes is progressive and your doctor may need to increase the dose over time (refer 'Will I ever need to go on to insulin?' page 6).
- Metformin may need to be combined with the sulphonylurea or other classes of tablets and/or insulin.
- Metformin by itself does not cause hypoglycaemia (low blood glucose or 'hypo') but may contribute to hypoglycaemia when used in conjunction with a sulphonylurea tablet or insulin.

2. Sulphonylureas

<i>Chemical name</i>	<i>Some brand names</i>
GLICLAZIDE	Apo-gliclazide MR, Diamicon, Diamicon MR*, Genrx gliclazide, Glyade, Glyade MR*, Mellihexal, Nidem, Oziclide MR*
GLIBENCLAMIDE	Daonil, Glimel
GLIPIZIDE	Melizide, Minidiab
GLIMEPIRIDE	Amaryl, Apo-glimepiride, Aylide, Diapride, Dimirel, Glimepiride GA, Glimepiride Sandoz, Pharmacor glimepiride

Points to remember about sulphonylureas

- They lower blood glucose levels by stimulating the pancreas to release more insulin.
- They can cause hypoglycaemia. Be sure to discuss this with your doctor or health professional and refer to the *Hypoglycaemia and Diabetes* information sheet.
- Tablets should be taken just before a meal. There is less risk of hypoglycaemia if you have regular meals (and snacks if recommended) throughout the day.
- Side effects can include weight gain and rarely skin rashes, stomach upsets and jaundice.
- Should not be taken by women who are pregnant or breast-feeding.
- Type 2 diabetes is progressive and your doctor may need to increase the dose over time (refer 'Will I ever need to go on to insulin?' page 6).
- Sulphonylureas may need to be combined with metformin and other classes of tablets and/or insulin.

3. Thiazolidinediones (glitazones)

<i>Chemical name</i>	<i>Brand names</i>
ROSIGLITAZONE	Avandia
PIOGLITAZONE	Actos, Apotex-pioglitazone, Pharmacor pioglitazone, Pioglitazone General Health, Pioglitazone Sandoz, Pioglitazone GA, Pizaccord, Vexazone.

Points to remember about thiazolidinediones (glitazones)

- They help to lower blood glucose levels by increasing the effect of your own insulin, especially on muscle and fat cells ie: they improve insulin resistance.
- Their effect is slow, taking days to weeks to begin working and one to two months for their full effect.
- They work well together with some of the other diabetes tablets.
- Taken on their own, they do not cause hypoglycaemia, but this can occur when they are taken with a sulphonylurea.
- Weight gain can be a side effect. Fat may shift from areas where it is bad for your health (around the waist) to other areas such as the top of the thighs, where you still may not want it but it is not as harmful to your health.
- Fluid accumulation is another side effect and glitazones should generally be avoided by people with heart failure. Discuss with your doctor whether or not they are right for you.
- They should not be taken by people who have liver disease.
- They should not be taken by women who are pregnant or breast-feeding.
- It is recommended that regular checks of liver function are done particularly in the first year of taking these tablets. Your doctor will need to discuss this with you when you start.

Pharmaceutical Benefits Scheme (PBS) listing for glitazones*

- Currently, Avandia is only prescribed as dual therapy in conjunction with either metformin or a sulphonylurea. It is not listed for use with insulin.
- Currently, Actos can be prescribed with metformin and/or a sulphonylurea, and with insulin where indicated.

4. Alpha glucosidase inhibitors

<i>Chemical name</i>	<i>Brand name</i>
ACARBOSE	Glucobay

Points to remember about alpha glucosidase inhibitors

- They help to slow down the digestion and absorption of certain dietary carbohydrates in the gut (intestine). Taken on their own, they don't cause hypoglycaemia.
- They can be taken together with other classes of medication including insulin.
- If hypoglycaemia occurs, due to another diabetes tablet or insulin you may be taking, it must be treated with pure glucose such as glucose tablets, gel or Lucozade. This is because taking Glucobay may result in reduced or too slow absorption of other forms of quick acting carbohydrates.
- Side effects include flatulence (wind), bloating and diarrhoea.
- They need to be started at low doses and increased slowly to reduce side effects.
- They need to be taken just before eating.
- They should not be taken by women who are pregnant or breast-feeding.

* At time of printing

5. DPP-4 inhibitors

<i>Chemical name</i>	<i>Brand name</i>
LINAGLIPTIN	Trajenta
SAXAGLIPTIN	Onglyza
SITAGLIPTIN	Januvia
VILDAGLIPTIN	Galvus

Points to remember about DPP-4 inhibitors

- They work by inhibiting the enzyme DPP-4. This enhances the levels of active incretin hormones which act to lower blood glucose levels by increasing insulin secretion and decreasing glucagon secretion (a hormone that has the opposite effect of insulin by increasing blood glucose levels).
- By themselves, they are unlikely to cause hypoglycaemia because they do not work when blood glucose levels are low.
- Sitagliptin and saxagliptin are used in combination with certain other oral diabetes medications (metformin, sulphonylurea such as glimepiride and glibenclamide, or rosiglitazone and pioglitazone), when healthy eating and physical activity plus the single oral medication does not provide adequate blood glucose management.
- Vildagliptin is used in combination with certain other oral medications (metformin, sulphonylurea, or pioglitazone), when healthy eating and physical activity plus the single medication does not provide adequate blood glucose management.
- They should not be used if you are under 18 years of age, are pregnant or intend to become pregnant, while breastfeeding or if planning to breastfeed, or for the management of type 1 diabetes or diabetic ketoacidosis. If you have kidney or liver problems, your doctor may prescribe lower doses.
- They are not likely to cause weight gain.

6. Incretin mimetics

<i>Chemical name</i>	<i>Brand name</i>
EXENATIDE	Byetta

Points to remember about incretin mimetics

- Currently Byetta is only prescribed when the maximum doses of either metformin or a sulphonylurea, or a combination of both fails to achieve an HbA1c equal to or less than 7% (or 53mmol/mol).
- Incretin mimetics are injected medications. They mimic the effects of the body's own 'incretin hormones' which help to manage blood glucose levels after meals.
- Exenatide helps to lower blood glucose levels by:
 - > stimulating the pancreas to release more insulin in response to eating carbohydrates
 - > reducing the amount of glucagon released from the pancreas after a meal
 - > slowing down the passage of food from the stomach to the gut so that food is absorbed more slowly and steadily
 - > increasing a feeling of fullness after eating.

Continued over...

- Exenatide is not a substitute for insulin for those people who require insulin to manage their diabetes.
- Exenatide may reduce your appetite, the amount of food you eat and your weight.
- Exenatide is injected under the skin (subcutaneous fat) of the thigh, abdomen or upper arms. It comes in a pre-filled pen with fixed dosing that contains enough doses to last for one month.
- Injections are usually given twice a day, within an hour before meals.
- It can be used with metformin or a sulphonylurea or both.
- Taken with metformin, exenatide usually doesn't cause hypoglycaemia, however this can occur when taken with a sulphonylurea (refer page 2).
- Side effects can include nausea, vomiting, and diarrhoea.
- Exenatide is not recommended for people with severe gastrointestinal disease or severe kidney disease.
- Allergic reactions may occur in some people.
- Exenatide should not be used in pregnancy. It should not be used when breastfeeding as it is unknown whether it passes into breast milk.
- Exenatide slows stomach emptying and can affect medications that need to pass through the stomach quickly.

Combinations

At some stage your doctor may decide to add a second or even a third class of tablet to maintain the effect on your blood glucose levels. For example, metformin plus a sulphonylurea is a common combination.

As an alternative to taking two separate tablets there are currently three products that combine two medications into a single tablet:

<i>Chemical name</i>	<i>Brand name</i>
METFORMIN/GLIBENCLAMIDE	Glucovance
METFORMIN/ROSIGLITAZONE	Avandamet
METFORMIN/SITAGLIPTIN	Janumet
METFORMIN/VILDAGLIPTIN	Galvumet

Points to remember about combinations

Refer to the 'Points to Remember' section relating to each medication:

- Glucovance See Biguanides (page 1) and Sulphonylureas (page 2)
- Avandamet See Glitazones (page 3) and Biguanides (page 1)
- Janumet See DPP-4 inhibitors (page 4) and Biguanides (page 1)
- Galvumet See DPP-4 inhibitors (page 4) and Biguanides (page 1)

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Others

Two other medications, orlistat (Xenical®) and sibutramine (Reductil®), are not specific to diabetes management but are used to help lose weight. However, they can affect blood glucose levels and cause hypoglycaemia if at risk. The doses may need to be reduced when taken together with diabetes tablets or insulin. Xenical® reduces the amount of dietary fat that is absorbed from the gut. It can sometimes help people change their eating habits and encourage a low fat diet. The side effects of flatulence (wind), diarrhoea and oily bowel movements can occur if you eat too much fat. Reductil® helps you to lose weight by making you feel satisfied though you've eaten less food. As these two weight loss medications are only suitable for certain people, discuss them with your doctor. After review, your doctor will choose the tablet or combination of tablets that's best for you.

Will I ever need to go on to insulin?

Type 2 diabetes is a progressive condition with decreasing insulin production over time. All of the blood glucose lowering medications listed require enough existing insulin to be effective. When a person with diabetes is no longer making enough of their own insulin, they will need insulin injections to manage their blood glucose levels. This can happen quite quickly but more often occurs in about 50% of people within 10 years of being diagnosed. Sometimes people remain on some or all of their tablets as well as insulin. Insulin is very safe and can be used in women who are pregnant and breast-feeding. It is a necessary medication for people with diabetes and, when used properly to manage blood glucose levels, can help reduce the risk of diabetes complications.

Other information

- If you drink alcohol, tell your doctor as it may affect the action of your medication. It can also mask the symptoms of hypoglycaemia.
- For more information about medications call NPS on 1300 633 424 or go to the consumer section of their website at www.nps.org.au.

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