

Diabetes Treatment - Insulin

Medication Information Leaflet

What is Insulin?

Insulin is a hormone produced by the pancreas that allows the body to use blood sugar for energy. Carbohydrates, a type of nutrient found in starchy foods such as bread, noodles, potatoes and rice, are converted into sugar and absorbed into the bloodstream. Insulin allows sugar from the bloodstream to enter the body cells and be used to create energy or be stored for future use.

People with diabetes are unable to fully use the sugar in their bloodstream either because their bodies do not make enough insulin or the cells do not respond well to insulin, a situation known as insulin resistance. Hence, they would need more insulin to get the same effects.

Insulin Therapy

There are two main groups of patients with diabetes and their treatment could be different.

- Type 1 Diabetes Mellitus (T1DM) requires the use of insulin and the patient needs to control their diet.
- Type 2 Diabetes Mellitus (T2DM) patients may be treated with oral medications and need to control their diet. In some T2DM patients, they may also require insulin injections.

Insulin is injected into the fatty tissue that is between the skin and muscle layer.

Starting on insulin when already on oral tablets for T2DM patients

T2DM is a progressive illness. This means that what you did at the beginning to control your condition through your diet, exercise or medications may change over time.

As your diabetes progresses, the management of your condition can change from diet and exercise alone, to adding oral diabetes medications. Patients who have had diabetes for a long time may naturally find that they progress to a combination of oral diabetes medications and insulin.

Some T2DM patients might feel that once they have started insulin, it could mean that their condition is now very serious or they have “failed” in controlling their diabetes.

However, it is important to understand that this is a natural progression of the disease. If your diabetes is not controlled, it can lead to serious health complications such as an increased risk of heart disease and eye or kidney problems.

If you are on insulin, you should know how to:

- Measure out your insulin doses
- Inject insulin yourself (and not rely on others) as far as possible
- Adjust your diet and activity to your insulin injections

Types of Insulin

There are several types of insulin. They differ mainly in how quickly they start to lower blood sugar once injected, and how long their effects last in the body.

Type	When to take it	When the medication starts working after you have injected it	How long does the medication effect last after you have injected it
Rapid-acting <ul style="list-style-type: none"> • Apidra[®] • Novorapid[®] • Humalog[®] 	Immediately before a meal	10-20 minutes	2-4 hours
Short-acting <ul style="list-style-type: none"> • Actrapid[®] HM • Humulin[®] R 	30 minutes before a meal	30 minutes	6-8 hours
Intermediate-acting <ul style="list-style-type: none"> • Humulin[®] N • Insulatard[®] HM 	Before breakfast and/or at bedtime	1-3 hours	16-24 hours
Long-acting <ul style="list-style-type: none"> • Levemir[®] • Lantus[®] • Toujeo[®] • Tresiba[®] • Soliqua[®] * 	Daily at the same time (eg. bedtime)	3-4 hours	Variable. Up to 24 hours for Levemir [®] , Lantus [®] and Soliqua [®] . May last more than 24h for Toujeo [®] and Tresiba [®] .
Pre-mixed These are mixtures of rapid/ short-acting and intermediate/ long-acting insulins <ul style="list-style-type: none"> • Humalog[®] Mix • Novomix[®] 30 • Mixtard[®] 30 • Humulin[®] 30/70 • Ryzodeg[®] 	Variable, inject before meals. Refer to your medication label for timing of injection for your specific type of pre-mixed insulin	Variable	Variable, 14 to more than 24 hours

Low blood sugar (hypoglycemia) is more likely to occur around the time of maximum action. High blood sugar (hyperglycemia) is more likely to occur before the insulin starts acting or when its action is ending.

* Soliqua[®] is a combination of long-acting insulin and lixisenatide (another type of diabetes medication class known as GLP1 agonist)

How to Inject Insulin

Knowing where to inject your insulin will make the injection easier, safer and more comfortable. Insulin is injected into the fatty tissue that is between the skin and muscle layer. After insulin is injected, it is absorbed into the blood and is used by your body.

There are three main areas of injection:

- Abdomen — insulin is absorbed fastest here into the blood
- Arm
- Thigh and buttocks — insulin is absorbed slowest here into the blood

Your doctor or nurse will advise you on the best area to inject. You should keep to the same injection area (abdomen OR arm OR thigh/buttock) to ensure consistent insulin absorption.

You should rotate the injection site within the same area to prevent your body from forming lipodystrophy (a small lump or dent in the skin that forms when a person repeatedly injects in the same spot).

- Insulin injected into these hardened areas may not be absorbed well.
- Check your injection areas every few days by pressing gently and running your fingertips across the skin.
- Inform your healthcare professionals if there are any lumps, painful spots or change in colour anywhere.
- Avoid using these areas until they have recovered.

If you are injecting into the abdomen area, inject at least two inches away from the belly button and avoid areas with scars or bruises.

You may refer to this article for more details on insulin injection techniques.

Handling and storage

Unopened insulin should be stored in the refrigerator (not in the freezer). Frozen insulin cannot be used. You should always keep at least one extra vial or pen of each type of insulin.

Once opened, the insulin vial or pen should be stored at room temperature and away from direct sunlight. The opened insulin vial or pen can be kept for four to six weeks depending on the type of insulin you use. Refer to your medication label to check how long you can keep your insulin for.

When you are travelling, carry your insulin and syringes with you. Do not put the insulin in your check-in luggage or in your car boot.

Discard the insulin if

- It has expired
- Your insulin has changed colour
- You are using a clear insulin and you find particles in it. Examples of clear insulins are Apidra, Novorapid, Actrapid and Glargine.
- You are using a cloudy insulin and you see white substances that remain at the bottom of the container after mixing even after you roll the vial or pen thoroughly. Examples of cloudy insulins are Mixtard and Novomix.

Insulin Devices

Syringes

Syringes are used to deliver the correct and accurate insulin doses to patients. Choose a suitable syringe that best matches the number of units required.

A 0.3mL syringe should be used for doses up to 30 units. A 0.5mL syringe should be used for doses up to 50 units. A 1mL syringe can be used for doses up to 100 units.

Do not reuse insulin syringes. Throw away the syringe after every injection.

Insulin Pens

Insulin pens combine both the insulin cartridge and measuring dial into one device. Some insulin pens are disposable whereas some are reusable. Thus, insulin injections become more convenient as you do not have to carry syringes and insulin vials separately with you.

Insulin Pumps

The insulin pump is a small computerised device that pumps insulin continuously through a fine plastic tube into a site under the skin throughout the day.

Pump users have to monitor their blood sugar frequently so as to make adjustments to the amount of insulin delivered. The insulin pump generally gives you better control and more meal flexibility but is more expensive and requires more frequent blood sugar monitoring.

Side Effects

The most common side effect with the use of insulin is low blood sugar. If you inject insulin but do not eat on time, your blood sugar may become too low. Low blood sugar levels might also happen if you do not eat well or if you drink alcohol on an empty stomach while on insulin therapy.

Symptoms of low blood sugar include:

- Weakness
- Dizziness
- Hunger
- Sweating
- Trembling
- Blurred vision
- Walking unsteadily
- Fast heartbeat

If you experience any of these low blood sugar symptoms, do the following immediately:

Step 1: Check your blood sugar level with a home blood sugar meter (glucometer) if available. If your blood sugar level is less than 4 mmol/L, take 15 grams of fast-acting sugar such as:

- 3 glucose tablets or
- Half a glass of fruit juice (200ml) or
- 1 can of less sugar soft drink (330ml) or
- 3 teaspoons of sugar, honey or syrup

Step 2: Monitor yourself for 15 minutes. If you have a glucometer (home blood sugar meter), check your blood sugar level again after 15 minutes.

Step 3: If your blood sugar level is still less than 4 mmol/L or you still have symptoms of low blood sugar, you should take another 15 grams of fast-acting sugar as per Step 1.

If your symptoms do not go away, see a doctor or go to the hospital immediately.

Step 4: Take your meal or snack if your blood sugar level is 4 mmol/L and above after consuming the fast-acting sugar earlier on.

Inform your doctor about this during the next visit.

Other side effects include:

- Some patients may also experience mild pain, redness, bruising, swelling, a small lump or dent of the skin at the injection site.
 - Do not reuse your needles, rotate injection sites within the recommended areas and use shorter needles (4mm or 6mm) to reduce the chances of developing such reactions.
 - They also usually go away in a few days to a few weeks.
 - See a doctor if you frequently experience this. Your injection technique may need to be reviewed.
- Rashes on the injection site or, in rare cases, all over the body

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Disclaimers

Please take note that the above is not a complete list of all possible side effects. If you have any concerns about your medication or if you have other side effects that you think are caused by this medication, please consult your doctor or pharmacist.

This article is jointly developed by members of the National Medication Information workgroup. The workgroup consists of cluster partners (National Healthcare Group, National University Health System and SingHealth), community pharmacies (Guardian, Unity and Watsons) and Pharmaceutical Society of Singapore. The content does not reflect drug availability and supply information in pharmacies and healthcare institutions. You are advised to check with the respective institutions for such information.

Please visit www.moh.gov.sg/knowyourmeds and www.ndf.gov.sg for more information on medication.

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