



Type 2 diabetes

Type 2 diabetes: treatment

P a t i e n t I n f o r m a t i o n

INTRODUCTION	3
ORAL MEDICATION: ORAL ANTI-DIABETIC DRUGS	4
1. Medication that makes insulin more effective	
2. Tablets that promote insulin production	
3. Drugs that increase incretin levels: DPP-4 inhibitors	
4. Medication to remove excess glucose via urine: SGLT2 inhibitors	
INCRETIN MIMETICS OR GLP-I ANALOGUES	12
What are incretin mimetics or GLP-I analogues?	
Injecting incretin mimetics	
INSULIN	16
Types of insulin	
Injecting insulin	
Storing insulin	
Lipodystrophy	
Fasting before an examination or minor procedure	
What should you do if you have missed an injection?	
COMBINATION DRUGS	25
OTHER MEDICATION	25
TREATMENT OF OTHER RISK FACTORS	26
Smoking	
Cholesterol and other fats	
High blood pressure or hypertension	
Excess weight or obesity	
WHERE CAN YOU OBTAIN SELF-MONITORING MATERIALS/EQUIPMENT?	28
What is a diabetes care programme?	
Advantages	
General terms and conditions	
What should you bring to a consultation with a diabetes consultant?	
FURTHER INFORMATION	26

The basic conditions for successful diabetes management are still a healthy and balanced diet, sufficient exercise and monitoring your weight. In many cases, however, this is not enough and medication is needed to treat type 2 diabetes.

This brochure provides specific information on the various treatments available for mellitus type 2 diabetes.





ORAL MEDICATION: ORAL ANTI-DIABETIC DRUGS

Oral anti-diabetic drugs – medication ingested via the mouth – can be classified on the basis of their specific action into **four major groups**:

1. Medication that makes insulin more effective. In other words, medication which improves sensitivity to insulin.
2. Medication that promotes the release of insulin from the pancreas.
3. Medication that increases incretin levels, tiny hormones excreted by the intestine following a meal.
4. Medication that has an impact on the kidneys to remove more excess glucose via urine.

I. MEDICATION THAT MAKES INSULIN MORE EFFECTIVE

BIGUANIDES

You have to take the following medication:

Metformin has been on the market the longest. It is usually the first medication to be prescribed for treatment.

Action

The medication works at three levels:

- The speed at which glucose is absorbed from the intestine is reduced, to ensure that glucose enters the blood more gradually.
- Glucose production by the liver is reduced.
- The available insulin is better able to act upon the cells (the drug increases 'peripheral insulin sensitivity').

Benefits

- Slight weight loss of 1 to 2 kg
- No risk of a hypo (hypo: blood sugar level below 60 mg/dl)

Mogelijke nevenwerkingen

- Nausea
- Metallic taste in the mouth
- Bloating and increased flatulence
- Cramps
- Diarrhoea

Side effects can be minimised by starting with a low dose of the medication and gradually increasing it. It is advisable to take the medication **after a meal**.

The doctor in charge of your treatment will decide the maximum dose you can take depending on your kidney function.



Note. The medication must be stopped before an operation or examination with contrast medium and not taken again until two to three days after the operation or examination.

GLITAZONES

Action

Glitazones reduce resistance to insulin. The improvement in blood sugar levels is slow to take effect, but long acting.

These drugs are now rarely prescribed.

Benefits

- No risk of a hypo

Potential side effects

- Fluid accumulation
- Increased risk of heart failure
- Weight increase

2. TABLETS THAT PROMOTE INSULIN PRODUCTION

SULPHONYLUREA

You have to take the following medication:

Action

Sulfonylurea werken voornamelijk op de pancreas. Ze stimuleren de bètacellen om insuline te produceren.

Benefits

- Sulphonylurea are powerful glycaemia lowering drugs, i.e. they lower blood sugar levels.
- They promote better blood sugar management during meals.
- Short or long acting drugs are available. With **long acting medication it is best** to take the full dose **before breakfast**. **Short acting medication is best taken 15 minutes before a meal**.

Potential side effects

- When taking sulphonylurea you need to check that your blood sugar level isn't too low (hypoglycemia).
- If low blood sugar levels occur too frequently and they are always compensated for by eating a snack, this could lead to weight gain.

GLINIDES

You have to take the following medication:

Action

Glinides mainly affect the pancreas. They stimulate the beta cells to produce insulin.

Benefits

They have the same impact as sulphonylurea, but with a shorter duration of action. They are mainly used to prevent a glucose peak following a meal.

The medication should preferably be taken **15 to 30 minutes before a meal**. Do not take the medication if you are not eating.

Potential side effects

Kans op lage bloedsuikerspiegel (hypoglycemie)

3. DRUGS THAT INCREASE INCRETIN LEVELS: DPP-4 INHIBITORS

You have to take the following medication:



Action

DPP-4 inhibitors (also referred to as gliptins) increase the level of incretins, which are natural hormones that promote correct glucose regulation following a meal. Incretins are excreted by the intestine during a meal.

Natural incretins are quickly broken down by the DPP-4 enzyme.

DPP-4 inhibitors block this DPP-4 enzyme, to slow down the rate at which the incretins are broken down and increase their concentration.

- DPP-4 inhibitors stimulate the production of insulin.
- They also inhibit the production of a hormone called glucagon, which promotes the release of glucose from the liver.
- They slow down the rate at which the stomach is emptied so that you quickly feel full.

This medication is best taken **with a meal**.

Benefits

- No risk of a hypo (low blood sugar level)
- No increase in weight

Potential side effects

Very rare: gastrointestinal problems, which can be prevented by:

- Eating more slowly
- Chewing well
- Stopping eating when you feel full

4. MEDICATION WHICH REMOVES EXCESS GLUCOSE VIA URINE: SGLT2 INHIBITORS

You have to take the following medication:

Action

SGLT2 inhibitors are a group of drugs that lower blood sugar levels by stimulating the excretion of glucose via urine.

In healthy individuals with normal blood sugar levels any glucose passing through the kidneys is 'recycled' and consequently reabsorbed by the blood. 90% of the glucose is recycled via the SGLT-2 channels located in the walls of the kidney drainage tubes.

The medication blocks the SGLT-2 channels and thus reduces the re-absorption of glucose in the kidneys to ensure that more sugar is excreted via urine. This then leads to a reduction in blood sugar levels.

The doctor managing your treatment will decide whether this medication is appropriate for you, which depends upon the functioning of your kidneys.

Benefits

- Low risk of low blood sugar levels or hypoglycaemia (unless used in conjunction with sulphonylurea or insulin)
- Weight loss
- Reduction in blood pressure
- Particularly beneficial for patients with heart failure, with a previous history of heart or cardiovascular disease and/or chronic kidney problems.

Potential side effects

- Increased risk of genital (fungal) and urinary tract infections.
- Low blood pressure, so please be vigilant if you are taking diuretics at the same time.
- Ketoacidosis, a build-up of acids in the blood (symptoms: thirst and frequent urination, nausea/vomiting, dehydration, etc.)

INCRETIN MIMETICS OR GLP-I ANALOGUES

It may become clear after a while that an adapted lifestyle and oral medication are no longer effective and that you will have to progress to [medication by injection](#).

WHAT ARE INCRETIN MIMETICS OR GLP-I ANALOGUES?

This medication needs to be injected:

Incretin mimetics are

- injected daily
- injected weekly

Incretins are hormones which are produced in the small intestine when you are eating a meal that includes carbohydrates. Injectable GLP-I analogues mimic the action of incretins. Because incretins, similar to insulin, are proteins they need to be injected.

Action

- Stimulation of beta cells resulting in increased insulin production.
- Reduced glucagon secretion, resulting in less glucose being released from the liver.
- Stomach emptied more slowly so that you feel full more quickly.
- Impact on the saturation centre in the brain: reduced hunger pangs.

Benefits

- Weight loss
- Low risk of low blood sugar levels (hypoglycaemia) unless used in conjunction with sulphonylurea or insulin.

That is why the doctor may reduce the amount of sulphonylurea or insulin when starting with incretin mimetics.

Particularly beneficial for patients with a previous history of heart and cardiovascular disease and/or chronic kidney problems.

Potential side effects

Gastrointestinal complaints such as nausea, vomiting and diarrhoea when starting the medication. These side effects usually disappear after a while. They can to some extent be prevented by:

- Eating small meals
- Chewing well
- Eating slowly and not drinking with a meal
- Stopping eating when you feel full

INJECTING INCRETIN MIMETICS

Where?

Incretin mimetics are injected subcutaneously, preferably in the abdomen.

How?

Depending on the type of GLP-1 analogues the medication will need to be injected daily or weekly.

A diabetes educator will show you how to use the correct injection technique.

Some things to remember

- Vent the needle when you are using a new pen.
- Use needles that are 4 to 5 mm long.
- Always inject the prescribed dose.
- Insert the needle vertically into the skin.
- Inject the product.
- Wait for 10 seconds and remove the needle from the skin.

Changing the needle

Replace the needle on your pen **for every injection**. Discard the needle after the injection. Do not dispose of needles in a bin bag but use an **approved needle container**.

When it is full to the maximum line, seal the container with the cover provided with it and take it to the local **refuse/recycling centre**. Used needles are actually classed as small hazardous waste.



- Some pens can only be used once and have a fixed needle. Once used these pens should also be disposed of in the needle container.
- Blood glucose strips (used or not used) and empty pre-filled pens (without needle) can be disposed of in the residual waste bag.

Approved needle containers can be purchased from pharmacies, medical wholesalers or the Diabetes Liga. A number of cities and communities provide the containers free of charge. Check with your local community.

Storage method

- Keep your reserve of incretin mimetics in the door or vegetable drawer of the fridge.
- Pens are best stored at room temperature, as injecting cold fluids can be painful.

What should you do if you need to fast?

- If you need to fast, e.g. for a blood sample, examination or other intervention, it is ok to inject the incretin mimetics as normal.

What should you do if you have missed a dose?

- Inject the missed dose immediately.

INSULIN

TYPES OF INSULIN

The treatment is often started with a single injection of slow acting insulin or two injections of mixed insulin.



Insulin with medium term duration of action

This medication needs to be injected:.....

This insulin starts to work approximately one and a half hours after the injection and works for about 12 to 14 hours.

The insulin needs to be injected in the morning before breakfast or at a set time in the evening, depending on what the doctor advises.

Long acting insulin analogues

This medication needs to be injected:.....

The injection needs to be administered at a set time.

Combination drugs

The treatment of diabetes often consists of two injections with mixed insulin each day. There are two possibilities: you might be treated with traditional mixed insulin or with mixed insulin analogues.

I. Traditional mixed insulin

This medication needs to be injected:

This is a mixture consisting of fast and slow acting insulin.

For example: Humulin 30/70[®]. 30% of this insulin is fast acting and 70% slow acting.

This insulin must always be injected before breakfast and before the evening meal, preferably 20 minutes before you eat. The amount of insulin needed before breakfast and before the evening meal will be prescribed by your doctor. For example:

Before breakfast:	16E Humuline [®] 30/70
Before the evening meal:	12E Humuline [®] 30/70

E = unit



REMEMBER! The above is merely an example. You will be prescribed different amounts (units).

2. Premixed insulin analogues

This medication needs to be injected:

This is a mixture consisting of super-fast and slow acting insulin. This insulin must always be injected before breakfast and before the evening meal, preferably approximately 10 minutes before you eat. The amount of insulin will be prescribed by your doctor. For example:

Before breakfast:	15E Novomix 30
Before the evening meal:	13E Novomix 50

E = unit

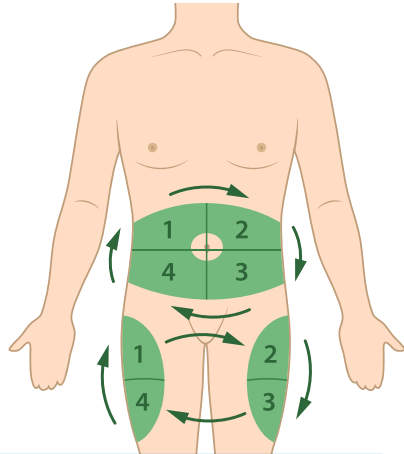


REMEMBER! The above is merely an example. You will be prescribed different amounts (units).

INJECTING INSULIN

Where should you inject?

Insulin is injected subcutaneously in the abdomen and/or upper leg.



Injection method

- It is advisable to use 4 or 5 mm pen needles.
- Check that insulin is being released from the pen: dial up 2 units and expel this test shot over your hand. If no drops of insulin appear dial up and expel two units again. Keep repeating this until drops of insulin appear.
- Set the insulin dose (quantity) you need to inject.
- Insert the needle vertically into the skin (raise a fold of skin with pen needles that are 6 mm long or longer) following the advice of the diabetes nurse.
- Inject the insulin.
- Wait for 10 seconds.
- Take the needle out. If you have raised a skin fold allow the fold to slowly return to normal before taking the needle out.

When should you replace a needle?

The needle on your insulin pen should be replaced **daily**. Put a new needle in the pen every morning. Discard the needle after the last injection.

Do not dispose of needles in a bin bag but use an **approved needle container**. When it is full to the maximum line, seal the container with the cover provided with it and take it to the local **refuse/recycling centre**. Used needles are actually classed as small hazardous waste.



Approved needle containers can be purchased from pharmacies, medical wholesalers or the Diabetes Liga. A number of cities and communities provide the containers free of charge. Check with your local community.

- Blood glucose strips (used or not used) and empty pre-filled insulin pens (without needle) can be disposed of in residual waste bags.
- Empty insulin cartridges or bottles (glass) can be disposed of with glass waste.

STORING INSULIN

- ✓ Store reserve insulin in the door or vegetable drawer of the fridge.
- ✓ Pens are best stored at room temperature as injecting cold fluids can be painful.

LIPODYSTROPHY

Lipodystrophy or a lipo is a general term for an abnormal accumulation of fat tissue under the skin caused by frequent insulin injections in the same place.

Consequences

Lipos can be a cause of difficult or poor diabetes management. The injected insulin is stored in the subcutaneous tissue accumulation and released at irregular intervals resulting in inexplicably high and low blood glucose levels. Lipos can result in unattractive lumps that could have an impact on a patient's self-confidence.

Causes

- Multiple insulin injections in the same part of the skin.
- Not, or insufficiently, changing the places where insulin is injected.
- Repeatedly using the same needle.

Treatment

- Prevention is better than cure: alternate injection sites.
- Use a new needle every day.
- If a lipo has developed already: avoid using the affected part of the skin (can take several months to heal).



Remember! If you suddenly start using a different part of the skin for your injections you may need less insulin! If necessary, the insulin dose will have to be adapted.

FASTING BEFORE AN EXAMINATION OR MINOR PROCEDURE

- **You are injecting medium term acting insulin or a combination drug once a day.**

If you inject in the morning:

- On the day of the examination or procedure: inject half the dose in the morning.
- Check your blood sugar levels before a meal and before going to bed.

If you inject in the evening:

- The night before: inject the normal dose.
- On the day: inject the normal dose in the evening and check your blood sugar levels before a meal and before going to bed.

- **You are injecting a long acting insulin analogue**

If you inject in the morning:

- The day of the examination or procedure: inject the full dose in the morning.
- Check your blood sugar levels before a meal and before going to bed.

If you inject in the evening:

- The night before: inject the normal dose.
- On the day: inject the normal dose in the evening and check your blood sugar levels before a meal and before going to bed.

- **You are injecting a combination drug twice a day**

The night before: inject the normal dose.

- The day of the examination or procedure: inject half a dose in the morning and restart with a normal dose in the evening with the evening meal.
- Measuring a day profile.

WHAT SHOULD YOU DO IF YOU HAVE MISSED AN INJECTION?

- **You are injecting medium term acting insulin**
 - Until at the latest 12 hours after the original time: inject half a dose.
 - More than 12 hours after the original time: skip the injection and inject the next dose at the original time.
- **You are injecting a long acting insulin analogue**
 - Until at the latest 12 hours after the original time: inject half a dose.
 - More than 12 hours after the original time: skip the injection and inject the next dose at the original time.
 - EXCEPTION: Tresiba®. This insulin can be injected as soon as you remember. Thereafter administer the injection at the original time.
- **You are injecting a combination drug**
 - Up to maximum 2 hours after the original time: inject half a dose and eat some carbohydrates.
 - More than 2 hours after the original time: skip the injection and inject the next dose at the original time.

COMBINATION DRUGS

Medication that combines two substances is also available.

Oral anti-diabetic drugs are based on a combination of:

- ✓ DPP4-inhibitors together with Metformin
- ✓ SGLT2-inhibitors together with Metformin
- ✓ SGLT2-inhibitors together with DPP4-inhibitors

Injectable medication offers a combination of

- ✓ Slow acting insulin together with a GLPI-analogue.

OTHER MEDICATION

If someone is diagnosed with diabetes the doctor in charge of the treatment will often prescribe several types of medication. After all, medication is required not only to check blood sugar levels but also to keep the patient's blood pressure and cholesterol low.

Studies have shown that, in addition to optimum blood sugar level management, the risk of heart and cardiovascular disease is considerably reduced if other risk factors are tackled also.

TREATMENT OF OTHER RISK FACTORS

SMOKING

Smoking is a number one risk factor for heart and cardiovascular disease.

This applies to all of us, but because people with diabetes are already at a considerably higher risk, it is all the more important to stop smoking!



Moreover, smoking has a negative impact on insulin sensitivity and consequently makes it more difficult to manage blood sugar levels successfully. If you are unable to stop smoking independently, medication or dedicated support to stop smoking may be useful. Do not hesitate to discuss this with your GP.

CHOLESTEROL AND OTHER FATS

Type 2 diabetes often coincides with a rise in blood cholesterol and triglycerides. People with type 2 diabetes, particularly if they are overweight, will also frequently show a reduction in HDL cholesterol (good cholesterol) and an increase in LDL cholesterol (bad cholesterol). This can be improved with both lifestyle adjustments and medication. Current advice states that people with type 2 diabetes should be prescribed statins (cholesterol lowering medication) because of their beneficial impact on heart and cardiovascular disease.

HIGH BLOOD PRESSURE OR HYPERTENSION

High blood pressure also has a significant impact on the risk of heart and cardiovascular disease, in particular the risk of a stroke. Various studies have shown that a reduction in blood pressure goes hand in hand with a lower risk of a stroke.

High blood pressure is diagnosed more often in people with diabetes and obesity than in people with a normal weight. Target blood pressure levels are even lower in people with kidney disorders.

To successfully manage blood pressure, one or more blood pressure lowering drugs may be prescribed.



EXCESS WEIGHT OR OBESITY

Excess weight (BMI in excess of 25) and obesity (BMI in excess of 30) contribute to the development of type 2 diabetes. A healthy lifestyle is based on a healthy diet and daily exercise (30 minutes per day).



Studies have shown that a 5% reduction in weight (i.e. 5 kg for someone weighing 100 kg) results in better glucose management, lower blood pressure and a reduction in cholesterol and triglycerides.

WHERE CAN YOU OBTAIN SELF MONITORING MATERIALS/EQUIPMENT?

If you inject GLP-I analogues, one or two insulin injections, or a combination of both and measure your blood glucose regularly, you will qualify for a refund for self-monitoring material from your health insurance fund.

Your GP will request this refund and the doctor will then initiate a 'diabetes care programme'.

WHAT IS A DIABETES CARE PROGRAMME?

It is a contract involving three parties, i.e. you, your GP and the consultant endocrinologist, aimed at promoting the personal management of your diabetes.

Your GP will act as a **coordinator** for the care programme and the consultant will support your GP with their specific expertise.

The signed contract will be submitted to the health insurance fund adviser.

BENEFITS

- ✓ Refund in full for diabetes education provided by a recognised diabetes educator.
 - Five 30 minute education sessions annually.
- ✓ Refund in full for consultations with your GP (minimum twice a year) and diabetes consultant (at least once a year).
- ✓ Partial refunds for dietary and podiatric advice with a prescription from your GP.
 - two 30 minute sessions with a recognised dietician.
 - two 45 minute sessions with a recognised podiatrist if your feet are at risk.
- ✓ Entitlement to self-monitoring material free of charge **with a prescription from your GP**, available from pharmacies or home care stores.
 - 1 blood glucose meter every 3 years.
 - 150 glucose strips every 6 months.
 - 100 lancets every 6 months.

Remember

- If you use more strips (more than 150 strips every 6 months) or stop administering injections, you will have to pay for the care material yourself.
- ✓ Buying pen needles is your responsibility.

GENERAL TERMS AND CONDITIONS

- The global medical dossier (GMD) must be managed by your GP.
- You must consult your GP at least twice a year and your consultant at least once a year. One year means twelve months from the start of the contract.

WHAT SHOULD YOU BRING TO A CONSULTATION WITH A DIABETES CONSULTANT?

- Your diabetes diary and glucose meter: to every consultation, also with your GP.
- Laboratory results.
- Medication list.
- Where applicable, reports from your diabetes educator.
- A report from your ophthalmologist.
- In the event of monitoring at UZ Leuven: the letter sent to you, completed by your GP.

FURTHER INFORMATION

Do you have problems or further questions?

- ✓ If so, please contact the diabetes nursing staff
 - on 016 34 34 75

- ✓ Information is also available online via
 - UZ Leuven: www.uzleuven.be/diabetes
 - The Diabetes Liga: www.diabetes.be

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