

Insulin in type 1 diabetes

- Basal bolus

Basal bolus insulin is used to replace the insulin that is no longer produced in type 1 diabetes. The 'basal bolus insulin' approach most closely matches how the body would make insulin in a person without type 1 diabetes.

The aim of insulin is to:

- > avoid and/or correct high blood glucose
- > avoid low blood glucose
- > reduce your risk to diabetes related complications.

What is basal bolus insulin?

Basal bolus insulin is a combination of long acting insulin and rapid acting insulin injections.

The main advantage of using basal bolus insulin is that it allows you to match how your own body would release insulin if it was able to. Basal bolus insulin is also more flexible than using 'fixed' insulin doses as it allows you to choose what you want to eat, when you want to eat it.

What is basal insulin?

Basal insulin (*also known as background insulin*) is needed to allow different cells to take in and use glucose when you are asleep or during the day (between meals).

Long acting insulin or intermediate acting insulin is used as these types of insulin assist your body over a long period of time, to get the energy it needs, while keeping your blood glucose levels within target.

Basal insulin makes up about 50% of the insulin you need in 24 hours and is commonly given once a day at night time (eg 9:00pm). However, it can also be given at other times or even split into two injections at morning and night.

What is bolus insulin?

Bolus insulin (*also known as meal related insulin*) is needed at main meal times (eg breakfast, lunch and dinner) to keep the blood glucose, which rises after eating, in target.

Rapid acting insulin is most commonly used because it works very quickly.

Bolus insulin makes up about 50% of the insulin you need in 24 hours and is split between your main meals. It is given immediately before your main meals. However, some people may be advised to give it during a meal (eg if hypoglycaemia needs to be prevented) and others immediately after a meal.

Adjusting the dose allows for greater flexibility in the amount of carbohydrates (CHO) you eat.

Bolus insulin does not last long, so it allows for greater flexibility in the timing of meals as a meal dose is unlikely to 'overlap' with another meal dose.



Total daily dose

Your total daily dose (TDD) is the number of units of insulin you use in 24 hours added altogether. The TDD is commonly used to calculate how much rapid acting insulin is required for a particular meal or to calculate how much extra rapid acting insulin is needed to return a high blood glucose level back into target.

My Total Daily Dose (TDD)	_____ units
----------------------------------	-------------

Your diabetes specialist, doctor or credentialed diabetes educator can assist you to learn more about adjusting your bolus insulin doses using your TDD.

Calculating rapid acting insulin doses for meals

All carbohydrate (CHO) foods are digested into glucose. The type and amount of CHO you eat will affect how quickly and how high your blood glucose will rise after a meal.

It is important to know what a CHO food is and how much you are eating so you can match your rapid acting insulin dose correctly.

CHO are generally counted in grams or 15gm exchanges (or serves).

A rapid acting insulin dose can be calculated for the number of grams or exchanges you eat. This calculation is known as your Insulin:CHO Ratio.

Insulin:CHO Ratio using the 500 Rule
If counting in grams : divide 500 by your TDD $500 \div \text{_____} (\text{TDD}) = \text{_____}$ <p>The answer suggests that 1 unit of rapid acting insulin is required for every _____ grams of CHO.</p>
If counting in 15gm exchanges ; divide 15 by the answer from Step 1 $15 \div \text{_____} = \text{_____}$ <p>The answer suggests that _____ units of rapid acting insulin is required for every 15gram exchange of CHO.</p>

A credentialed diabetes educator and dietitian will assist you to better understand what will work for you.

Are there any precautions?

Yes. This calculation is based on your current TDD and may require fine tuning. It should be reviewed if your insulin requirements change (eg change in activity, weight, illness, medication and if you become pregnant).

Calculating rapid acting insulin doses for correcting out of target blood glucose

Blood glucose will go out of your target range. If your blood glucose is low, you are at risk of hypoglycaemia. If your blood glucose is high and you have ketones, you can become unwell and quickly develop diabetic ketoacidosis.

Correctional insulin (*also known as supplemental insulin*) is used to manage hyperglycaemia and ketosis. Correctional doses are given in addition to your basal insulin and bolus insulin at meal times.

Rapid acting insulin is used as it works very quickly. Correctional insulin doses should be given straight away.

Correctional insulin can be given every 2-4 hours but you should seek medical assistance if your blood glucose remains high despite 2 extra correctional insulin doses.

A rapid acting insulin dose can be calculated to correct out of target blood glucose. This is known as the Insulin Sensitivity Factor (ISF).

Insulin Sensitivity Factor (ISF) using the 100 Rule
Step 1: Divide 100 by your TDD $100 \div \text{_____ (TDD)} = \text{_____ mmol/L}$
The answer suggests that 1 unit of rapid acting insulin will lower the blood glucose by _____ mmol/L.
5% of TDD: _____ units
10% of TDD: _____ units

Correctional doses are guided by your ISF and a percentage of your TDD. Correctional doses greater than 10% of your TDD are not recommended. Talk to your diabetes specialist, doctor or credentialed diabetes educator about what correctional dose suits you.

Are there any precautions?

Yes. Your ISF and correctional dose calculation is based on your current insulin doses and may require fine-tuning. It should be reviewed if your insulin requirements change (eg change in activity, weight, illness, medication and if you become pregnant).

Seek urgent medical assistance (eg ring an ambulance or ask someone to take you to the hospital emergency department) if;

- > your blood glucose remains above 15mmol/L despite 2 extra correctional insulin doses
- > you become drowsy or confused
- > have fast or usual breathing
- > have abdominal pain
- > unsure of what to do
- > too unwell to stay home.

A diabetes specialist, doctor, credentialed diabetes educator and dietitian will assist you to better understand what will work for you and assist you to learn more.

Where can I go for more information?

Diabetes Australia	www.diabetesaustralia.com.au
National Diabetes Services Scheme	www.ndss.com.au
My D (for under 25s)	www.ndss.com.au/MyD/
Australian Diabetes Educators Association	www.adea.com.au
Department of Health	www.health.gov.au

For more information

CHSA Diabetes Service
Country Health SA LHN
PO Box 287, Rundle Mall
ADELAIDE SA 5000
Telephone: (08) 8226 7168
www.chsa-diabetes.org.au

