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Ketone management and Sick Day Rules

For Children and Young People with Type 1 Diabetes

Information for patients, relatives and carers

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Ketones explained

Ketones develop in the blood stream when there is not enough insulin in the body (insulin is missed or undelivered on a pump) or glucose need is increased. When you are ill, your body needs more energy to fight the infection. Glucose is released from your body's stores to do this and blood glucose tends to go up, even if you are not eating. This means that you may need more insulin than usual when you are ill.

If you do not give enough insulin, your body cannot use the extra glucose and will start to break down fat for energy.

When fat is broken down, ketones are produced.

When ill, blood ketone levels should be tested 2-4 hourly and blood glucose levels 1-4 hourly. If not unwell, please check ketones when glucose has been 14mmol/L or above for more than 2 hours.

Blood ketones can be very dangerous

Ketones are acids which can quickly make you feel very unwell and can make you vomit and feel breathless.

If you do not get rid of the ketones, you can become extremely unwell and would need urgent hospital treatment (Diabetic Ketoacidosis-DKA)

When you are ill, ketones can still be produced even when your blood glucose is low.

Giving insulin stops your body making ketones. It is important to give your body the extra insulin it needs depending on the ketone levels (see table).

Therefore: Never stop your insulin (even if you are not eating) and always check for ketones if you feel unwell regardless of your blood glucose level.

Managing ketones with blood glucose less than 8.0 mmol/L
Table 1

Blood Ketones	Actions	Additional Actions for all
Less than 0.6 mmol/L	1. Give normal insulin doses for carbohydrates (consider temp basal rate decrease if persistent hypoglycaemia on a pump) 2. Ensure drinking sugar-free fluids	Recheck blood glucose and ketones every 2 hours and follow table If glucose reaches greater than 8.0mmol/L, recheck ketones and follow table 2 If glucose less than 4 mmol/L follow hypoglycemia management first Closed loop system – if persistent low glucose levels or ketones greater than 0.6 mmol/L consider putting pump into manual mode and using lower temporary basal rate, call for advice if needed Ring diabetes team or go to Emergency department if repeated vomiting or concerned
0.6-1.5 mmol/L	Tolerating food 1.Encourage to eat and drink. Give Insulin for food and sugary fluids as normal Vomiting and not tolerating food 1. Take 20g carbohydrate as sugary drink, even as sips eg. 5ml every 5 min	
>1.5 mmol/L	**High risk of DKA** Tolerating food 1.Give Insulin for food as normal 2.Drink sips of sugary fluids to keep glucose level in normal range Vomiting and not tolerating food 1. Take 20g carbohydrate as sugary drink, even as sips eg. 5ml every 5 min Call the diabetes team as you may require hospital admission	

Managing ketones with blood glucose greater than 8.0 mmol/L Table 2

Blood Ketones	Action	Additional Action for all
Less than 0.6 mmol/L	1.Give correction insulin dose for high glucose level (and for carbohydrates if eating) via pen or insulin pump 2.**Ensure drinking sugar free fluids**	Recheck blood glucose and ketones every 2 hours and repeat action in table Closed loop system – if ketones greater than 0.6 mmol/L consider putting pump into manual mode, call for advice if needed If blood glucose >14 mmol/L consider an increased temporary basal rate If glucose falls below 8.0mmol/L, recheck ketones and follow table 1 Ring diabetes team or go to Emergency department if vomiting or concerned
0.6-1.5 mmol/L	1. Give Insulin for high ketones (see table below) VIA PEN (even if on an Insulin pump). Do NOT give correction dose for high glucose level 2.Give Insulin for carbohydrates if eating (via pen or pump) 3.Ensure drinking sugar free fluids Pump advice: consider a pump failure and set change see ABCC rules	
>1.5 mmol/L	**High risk of DKA** 1.Give Insulin for high ketones (see table, double dose) VIA PEN (even if on Insulin pump) 2.Give Insulin for carbohydrates if eating (via pen or pump) 3.Ensure drinking sugar free fluids Pump advice: set change unless already done If ketones still over 1.5 mmol/L after 2 hours call the diabetes team	

Why are my ketones high when my blood glucose is not high?

Starvation Ketones are produced during periods of fasting
This is most likely to occur during episodes of diarrhoea and vomiting.
Your child/adolescent is not fueling the body with glucose so it will break down fat stores for energy which produces ketones.

Extra Insulin Doses (Ketone Dose)

Weight (kg)	Novorapid dose (units)	
	Ketones 0.6 – 1.5	Ketones above 1.5
10	+1	+2
20	+2	+4
30	+3	+6
40	+4	+8
50	+5	+10
60	+6	+12
70	+7	+14

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