

## MANAGING SICK DAYS AND PREVENTING KETOACIDOSIS

Children with diabetes don't get sick more often than other children. But illness can upset blood sugar control. Stress hormones increase during illness. This can make blood sugars high, even if your child is not eating.

Your child may need more insulin during illness. If there is not enough insulin, your child's body will burn fat for energy instead of sugar. This creates ketones. Ketones are a type of acid. A build-up of ketones can be toxic. Too many ketones can cause a very serious problem called diabetic ketoacidosis (DKA).

The body doesn't make ketones from eating too much. It may make small amounts of them during periods of starvation. This does not normally lead to DKA.

To manage sick days and to prevent DKA, follow these guidelines:

1. **Supervise your child during illness.** Even adolescents need adult supervision!
2. **Check blood sugar and ketones often.** This is very important if your child is vomiting. Vomiting often occurs with DKA. Make sure ketone testing strips are not expired. Throw away strips 6 months after you open them.
3. **Never skip an insulin dose!** Give the usual amount of insulin even if your child is not eating full meals. **Note:** Illness usually raises blood sugar. But this may not happen when there is vomiting or diarrhea. Vomiting or diarrhea can result in low blood sugar, especially in younger children. If blood sugar is less than 6 mmol/L and your child is not able to eat, you may need to lower the usual dose by up to 50%. If you don't know how much to give, call the doctor-on-call before giving the next dose of insulin. Remember, you must always give some insulin.
4. **If blood sugar is low and your child is vomiting, consider mini-dose glucagon.** If your child can't keep food or fluids down, this can help bring up blood sugar. See our handout *Mini-Dose Glucagon for Preventing Serious Hypoglycemia*.
5. **Give extra insulin every 2-3 hours as needed.** Use the "5-10-15-20 Rule" (see chart below) to give extra insulin when:
  - the blood sugar is higher than 15 mmol/L and
  - ketones are present in urine or blood (using Precision Xtra® meter).

**The extra insulin is always rapid-acting (Humalog®, NovoRapid® or Apidra®) or short-acting (Regular or Toronto) insulin.** The amount is a percentage of the total daily dose (TDD). The TDD of insulin is the total number of units of all the insulin your child takes in a day.

*Managing Sick Days and Preventing Ketoacidosis (continued)*

Example: If your child's insulin dose is: 10 units of NPH and 5 units of rapid in the morning, 3 units of rapid at suppertime, and 4 units of NPH at bedtime, then the total daily dose (TDD) is  $(10 + 5 + 3 + 4) = 22$  units of insulin per day.

Use the "5-10-15-20 Rule" chart below to figure out the percentage of extra insulin needed.

<b>"5-10-15-20 RULE"</b>			
IF URINE OR BLOOD KETONES ARE:		GIVE THIS MUCH EXTRA INSULIN:	
urine ketones:	blood ketones:	blood sugar 15 to 20	blood sugar over 20
negative (-)	less than 0.6 mmol/L	no extra insulin	give 5% of TDD
small (+)	0.6-1.5 mmol/L	give 5% of TDD	give 10% of TDD
medium (++)	1.5-3.0 mmol/L	give 10% of TDD	give 15% of TDD
large (+++/++++)	more than 3.0 mmol/L	give 15% of TDD	give 20% of TDD

How many units of short-acting insulin should you give? Look at the chart below. In our example, the TDD is 22 units per day. If the blood sugar is 17.5 and the ketones are medium, the extra insulin to be given is 10% of the TDD. In the chart below, you can see that is 2 units. If the blood sugar is over 20 and the ketones are medium, the extra insulin to be given is 15 % of the TDD. That is 3 units.

total daily dose (TDD)	5% of TDD	10% of TDD	15% of TDD	20% of TDD	POINTS TO REMEMBER
5-15 units	½ unit	1 unit	1½ units	2 units	<ol style="list-style-type: none"> <li>1. Give extra insulin if the blood sugar is <b>more than 15 mmol/L</b> and ketones are present. Note: Extra insulin may also be given if the blood sugar is above 20 mmol/L and there are no ketones.</li> <li>2. The extra insulin is only rapid- (Humalog, NovoRapid, or Apidra) or short-acting (Regular or Toronto).</li> <li>3. The extra insulin can be added to the usual dose. It can also be given as an extra dose with lunch or a small snack.</li> <li>4. Ketones should come down within a few hours. Call the doctor if they don't.</li> <li>5. <b>Even if there are ketones, do not give extra insulin if blood sugar is low.</b> Encourage your child to eat and drink more.</li> </ol>
16-25 units	1 unit	2 units	3 units	4 units	
26-35 units	1½ units	3 units	4½ units	6 units	
36-45 units	2 units	4 units	6 units	8 units	
46-55 units	2½ units	5 units	7½ units	10 units	
56-65 units	3 units	6 units	9 units	12 units	
66-75 units	3½ units	7 units	10½ units	14 units	
76-85 units	4 units	8 units	12 units	16 units	

6. **Make sure your child gets plenty of rest.** Rest is important when your child has ketones. Exercise will raise the blood sugars and cause the body to make more ketones.
7. **Give lots of fluids.** This prevents loss of too much water and salt (dehydration). If blood sugars are high, give your child sugar-free fluids. If blood sugars are low, give sweetened fluids. Keep sugar and electrolyte-containing fluids in the house. These include sports drinks, electrolyte mixtures, and regular (non diet) ginger-ale.
8. **Make sure your child eats some carbohydrate.** Use your child's usual meal plan as a guide. Check blood sugars often. Use them to decide if more or less food is needed. If your child has trouble eating, you may have to make substitutions to the meal plan. Make sure your child eats/drinks the carbohydrates. Try to use both liquids and semi-solid or solid foods.

**Here are some examples of carbohydrates your child might be able to eat:**

- Liquids: juice, soft-drinks, milk, broth, popsicles and freezies, Jell-O.
  - Semi-solid foods: yogurt, ice cream, cereals with milk, chicken noodle soup.
  - Solid food: bread, crackers, rice, noodles.
  - Milkshakes made using milk, ice cream, yogurt or tofu, and fruit to fit the meal plan.
- Need more ideas of what to eat on sick days? See Chapter 11 of the *Beyond the Basics Resource* and Chapter 10 of *Food and Diabetes: For Kids, Teens, Families and Caregivers*.

9. **Take care with medications.**
  - Acetaminophen (e.g. Tylenol®) or ibuprofen (Motrin®, Advil®) liquid, tablets, or suppositories may be used for pain or fever. Follow the directions on the package.
  - For prolonged nausea or vomiting, Gravol® tablets or suppositories may be used with caution. Do not give Gravol® to children under 2 years of age. Gravol® can cause drowsiness.
  - Health Canada recommends that over-the-counter cough and cold products should **not** be used in children under 6 years old. Examples of these products include Benylin®, Tylenol for Colds®, Sudafed®, and Robitussin®. With children 6 years old and older, always follow dosing instructions carefully. Ask your pharmacist or doctor if you have any questions about over-the-counter cough and cold medications.
  - Prescription medications can be used as directed by your family doctor or pediatrician.
10. **Call the Diabetes Clinic or the Diabetes Doctor-on-call in these situations:**
  - You cannot get blood sugars or ketones down with 1-2 doses of extra insulin.
  - You need advice on how much insulin to give when your child is vomiting and can't keep down fluids.
  - You have treated a severe low blood sugar.
11. **Go to the hospital in these situations:**
  - You have used mini-dose glucagon and cannot keep the blood sugar above 4 mmol/L.
  - Your child has signs of DKA. Some signs of DKA are vomiting, stomach pain, sunken eyes, trouble breathing.

**NUMBERS TO CALL**

**Diabetes Clinic Phone:** 604-875-2868 or toll-free 1-888-300-3088, x2868, Monday to Friday 7:30 AM to 3:00 PM. If you need to leave a message, please state that your child is sick.

**Diabetes Clinic Fax:** 604-875-3231.

**24-hour Emergency Paging:** 604-875-2161, evenings and weekends. Ask the operator for the doctor-on-call for pediatric diabetes.