

A Consumer's Guide to Selecting an Insulin Program

By Gary Scheiner MS, CDE

The Insulin Program. For those of us with Type-1 diabetes, is there really anything more personal and significant in our lives? In a way, our insulin program “defines” our lifestyle. It can set us up for success or failure with our diabetes. Unfortunately, most of us are given little choice or education on how to select the insulin program that best meets our needs. We probably put a lot more thought and effort into choosing a car – a machine that may have fuel injection but is never injected below the skin.

Everyone should know by now that an insulin program should include “basal” or “background” insulin along with insulin “peaks” at mealtimes. Basal insulin is necessary to provide our body’s cells with a continuous supply of sugar to burn for energy, as well as to cover the liver’s secretion of sugar throughout the day and night. A complete lack of insulin at any time of day or night will result in a sharp rise in blood sugar levels, and possibly the buildup of acidic “ketones” as our body’s cells begin burning alternate, less-ideal fuel sources.

Each person’s basal insulin requirements are unique. Typically, basal insulin needs are higher during the night and early morning, and lower in the middle of the day. This is due to the production of blood-sugar-raising hormones during the night, and enhanced sensitivity to insulin that comes with daytime physical activity.

Basal insulin can be supplied in a variety of ways. Intermediate-acting insulins (NPH and Lente) taken once or twice daily will usually provide background insulin around-the-clock, albeit at much higher levels 4-8 hours after injection and at much lower levels at 16-24

hours. Long-acting insulin (Ultralente) provides basal insulin for 24-36 hours, but usually with a “peak” at 8-16 hours, followed by an extended drop-off in action. A 24-hour basal insulin (Lantus) offers relatively peakless background insulin for approximately 24 hours. Insulin pumps deliver rapid-acting insulin in small pulses throughout the day and night. With a pump, the basal insulin level can be adjusted and fine-tuned to match the body’s ebb and flow in basal insulin needs.

Mealtime insulin “peaks” are needed because of the rapid blood sugar rise that occurs after eating carbohydrates (sugars and starches). Carbohydrates usually take about 10-15 minutes to begin raising the blood sugar level, with a high point occurring 30-90 minutes following a meal.

Rapid-acting insulins (Novolog, Humalog) peak sharply about 60 minutes after injection. These can be used effectively to cover meals when taken just prior to eating. Regular insulin, which peaks 1-3 hours after injection, can provide adequate coverage when taken 30-60 minutes prior to the meal. However, due to its relatively slow/inconsistent peak and long duration of action (up to six hours), Regular is not usually the preferred insulin to use at mealtimes. In some cases, intermediate-acting insulins (NPH, Lente) are used to cover a meal that will be consumed 4-6 hours after injection. For example, NPH or Lente taken at breakfast can be used to cover the carbohydrates eaten at lunch. However, because of their broad and inconsistent peak, NPH or Lente taken in the morning will often cause the blood sugar to drop *before* lunch, followed by a sharp rise after lunch.

I have always been a fan of Consumer Reports magazine. I like the way the writers and editors provide objective side-by-side comparisons of the various features of competitive products. Recognizing that different features are important to different people, the Consumer Reports approach makes it easy to choose the products and services that will best meet our individual needs.

Here, then, is my “Consumer’s Guide” to selecting among the most commonly-used insulin programs:

Option 1: The “Beater”

Breakfast: NPH/Lente and Humalog/Novlog

Dinner: NPH/Lente and Humalog/Novolog

A “standard” program used in the 1980s and 90s (with Regular insulin instead of rapid-acting insulin), this plan’s main benefit -- its simplicity -- is also its downfall. With intermediate insulin peaking in the afternoon and at bedtime, the Beater plan limits flexibility in terms of meal times/amounts. It also predisposes the user to low blood sugars with delayed meals or added exercise, and high blood sugars with extra food or delayed injections. It’s a great program if you can’t stand to take shots, or if you just don’t want to think about your diabetes much. However, it’s not so good if you want to manage your blood sugars effectively and have a flexible schedule. It might work as well as the Economy Compact plan if you tend to have dinner very late on a regular basis.

Option 2: The Economy Compact

Breakfast: NPH/Lente and Humalog/Novlog

Dinner: Humalog/Novolog

Bedtime: NPH/Lente

This plan is often used by people who want an “intensive” program but find it impractical to take insulin at lunchtime. By moving the

intermediate insulin from dinner to bedtime, the peak is shifted to early morning (around the time of the “dawn phenomenon”) and reduces the risk of lows in the early part of the night. However, the morning intermediate insulin usually results in a blood sugar drop before lunch and a sharp rise after lunch. Afternoon snacks can also be a problem, since the morning intermediate insulin provides minimal coverage in the late afternoon. An additional shot of fast-acting insulin may be needed to cover a snack. As with the Beater program, this plan can produce frequent lows and difficulty adjusting for daytime exercise due to inconsistent absorption of the intermediate insulin.

Option 3: The Station Wagon

Breakfast: Humalog/Novolog

Lunch: Humalog/Novolog

Dinner: Humalog/Novolog

Snacks: Humalog/Novolog

Bedtime: NPH/Lente/Ultralente*

* Ultralente may be taken at dinnertime instead

Now we enter that wholesome, low-glitz zone known as “multiple injection therapy”. Intermediate or long-acting insulin taken at bedtime provides an early-morning peak to cover the dawn phenomenon, as well as a prolonged “tail” of action that ensures the presence of at least a trace of background insulin throughout the day. However, the peak and duration of intermediate and long-acting insulin can vary from day to day, putting the user at risk for high or low blood sugar in the morning. The Station Wagon plan is good for short trips. It requires a pit stop to fuel up with fast-acting insulin at every meal and snack, although snacks that are very low in carbohydrate may not require a shot. Many people find that insulin pens make frequent injections less of a chore than they might seem. Taking fast-acting insulin with each meal and snack offers the freedom to match insulin doses to carbohydrate consumption and

activity levels, as well as to make timely corrections for high readings.

Option 4: The Muscle Car

Breakfast: Humalog/Novolog

Lunch: Humalog/Novolog

Dinner: Humalog/Novolog

Snacks: Humalog/Novolog

Any time of day, consistently: Lantus

Lantus is that hot, shiny new insulin that everyone wants to take for a test drive. It is the first formulation that serves as a true “basal” insulin. It is relatively steady and peakless for approximately 24 hours. As with the Station Wagon program, the Muscle Car plan requires injections of fast-acting insulin with every meal and snack. Lantus must be given in its own syringe (it cannot be mixed with other insulins), meaning the potential for lots of shots. Although the lack of a “peak” translates into consistent absorption/action from day-to-day, it can also produce high readings in the morning (as the dawn phenomenon is not adequately covered) or lows in the middle of the day (as basal insulin needs tend to diminish). Overall, Lantus users still seem to experience far fewer lows than those who use intermediate insulin.

Option 5: The Engineered Import

Insulin Pump Therapy

Insulin pumps are beeper-sized, battery-operated devices that contain only rapid-acting insulin. Pumps are programmed (by the user) to deliver tiny pulses of insulin every few minutes throughout the day and night (basal insulin), and larger doses at mealtimes (bolus insulin). (Sorry about all the parentheses) The insulin is delivered just below the skin by way of a small, soft plastic tube called an “infusion set”. The infusion set must be changed every couple of

days in order to prevent infection and ensure consistent insulin absorption.

The thing that makes pump therapy unique is the ability to fine-tune and adjust basal insulin levels throughout the day and night. By matching the basal insulin to the body’s normal production of sugar, pumps allow the utmost freedom and flexibility in terms of food, activity and sleep patterns. Blood sugars hold *steady* between meals, snacks and boluses. Basal insulin levels can also be adjusted for events such as menstrual cycles, pregnancy, stress, illness and extended exercise. Obviously, it takes some extra training and education to learn how to make these kinds of adjustments on your own.

With insulin pumps, mealtime insulin is administered at the touch of a button. The doses are highly precise (to the nearest half, tenth or twentieth of a unit, depending on the pump model). Most pumps also offer the option of delivering mealtime insulin all at once or over an extended period of time – in case you expect your meal to take a while to digest.

Despite the fact that pump users tend to enjoy improved HbA1c levels, fewer hypoglycemic events and almost unlimited flexibility, pump use does have its drawbacks. It usually takes at least a month to fine-tune the pump’s basal rates and bolus formulas before decent control can be achieved. Because no long-acting insulin is used (only rapid-acting), pumpers are subject to ketoacidosis in the event of a mechanical problem or tubing blockage. Wearing the pump can be an inconvenience at times, and it poses a vanity issue for some people. Inserting the infusion set (the tube that delivers insulin underneath the skin) requires a relatively long introducer needle, which can be painful and intimidating at first. The tape that holds the infusion set in place can come loose or cause irritation. In addition, the cost of the pump (\$4000-\$6000, plus disposable supplies) makes it cost prohibitive for those who do not have adequate health insurance.

Program Comparisons

	Overall Control	Work Involved	Hypoglycemia Risk	Lifestyle Flexibility	\$ Price
Beater	☹	☺	☹	☹	☺
Economy Compact	☺	☺	☹	☹	☺
Station Wagon	☺	☹	☺	☺	☺
Muscle Car	☺	☹	☺	☺	☺
Engineered Import	☺	☺	☺	☺	☹

☺= good ☺= fair ☹= poor

Give It A Test Drive

Sure, choosing the right car is important. You have to find something that fits your budget and your needs. Personally, I'd love to tool around town in a silver Corvette Stingray convertible. Trouble is, you can't fit four kids, two booster seats, two infant car seats and all those diaper bags and coloring books into a Corvette Stingray convertible. Likewise, nobody wants to invest a lot of time or money on something that spends half its time in the shop – thus the value of researching and carefully considering your options.

Your insulin program has a major impact on how much time/work you need to commit to your diabetes, as well as your lifestyle, health risks, and long-term quality of life. Doesn't it deserve *at least* as much thought as choosing a car? If necessary, "test drive" a program for a month or two to see how it works for you.

And what if your health team doesn't want to cooperate with your decision? Ask them why. Perhaps they have some good arguments that will sway your decision. If not, you might want to look for another dealership. After all, this is

your diabetes, and you deserve the right to manage it in the manner that best suits you.

Now if you'll excuse me, I'm off to see my endocrinologist. My A1c is up a bit, and I'm in need of a tune-up.

Editor's note: Gary Scheiner is a Certified Diabetes Educator with his own private practice in Wynnewood, PA, specializing in intensive diabetes management. He has had Type-1 diabetes for 18 years and currently utilizes the engineered import plan (pump therapy) but drives a Dodge Grand Caravan.