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Comparison of Insulins (United States)

This chart compares insulins in regard to duration, usual frequency, and cost. It also provides information on route of administration, stability of in-use products at room temperature, and place in therapy. Other resources pertaining to insulin and injectable diabetes meds include our algorithm, *Initiation and Adjustment of Insulin Regimens for Type 2 Diabetes*, and our charts, *How to Switch Insulin Products*, *Insulin Analogs vs Human Insulin*, and *Comparison of GLP-1 Agonists*.

--Information in this chart is from U.S. product information (see footnote "a") unless otherwise specified.--

Insulin, Mfr	Duration	Usual Frequency	Formulations/Cost ^{b,c}	Stability, in-use, room temp
Rapid-acting: prandial human insulin analogs (rDNA origin). Onset 10 to 30 minutes (<i>Fiasp</i> , <i>Lyumjev</i> faster). ^{2,12} For type 1 diabetes , recommended at each meal (three or more injections daily) with one or two injections of basal insulin. ⁴ For type 2 diabetes , once daily at largest meal plus basal insulin, or basal-bolus regimen (i.e., two or three times daily with meals plus basal insulin). ³ All are given via subcutaneous injection. <i>Humalog</i> 100 unit/mL, <i>Lyumjev</i> , <i>NovoLog</i> , <i>Apidra</i> , and <i>Admelog</i> can be given subcutaneously via insulin pump. <i>Fiasp</i> , <i>Humalog</i> 100 unit/mL, <i>Apidra</i> , <i>NovoLog</i> , <i>Admelog</i> , and <i>Lyumjev</i> 100 unit/mL can be given by intravenous infusion. All are clear and colorless.				
Admelog (insulin lispro), Sanofi-Aventis	3 to 5 hours ²	One to three (or more) times daily. ^{3,4} Inject within 15 min before or immediately after a meal.	\$130.76/10 mL vial \$39.23/3 mL vial \$50.49/3 mL <i>SoloStar</i> pen \$252.47/5 of 3 mL <i>SoloStar</i> pen	Vial, pen: 28 days Pump reservoir: 7 days IV infusion: 4 hours (0.1 to 1 unit/mL in NS)
Humalog (insulin lispro), Eli Lilly (authorized generic available for 10 mL vial, and 100 unit/mL pens)*	3 to 5 hours ²	One to three (or more) times daily. ^{3,4} Inject within 15 min before or immediately after a meal.	\$137.35*/10 mL vial \$82.41/3 mL vial \$510.45/5 of 3 mL cartridge (\$102.09 each) \$265.20*/5 of 3 mL 100 unit/mL <i>KwikPen</i> or <i>KwikPen Junior</i> (\$53.04* each) \$424.32/2 of 3 mL <i>KwikPen</i> 200 unit/mL	Vial, cartridge, pen: 28 days Pump reservoir (<i>Humalog</i> 100 unit/mL): 7 days IV infusion: 48 hours (0.1 to 1 unit/mL in NS)
NovoLog (insulin aspart), Novo Nordisk	3 to 5 hours	One to three (or more) times daily. ^{3,4} Inject within 5 to 10 min before a meal.	\$289.36/10 mL vial \$537.47/5 of 3 mL <i>Penfill</i> cartridge \$558.83/5 of 3 mL <i>FlexPen</i>	Vial, cartridge, pen: 28 days Pump reservoir: 6 days IV infusion: 24 hours (0.05 to 1 unit/mL in NS, others). Diluted 1:1 (U-50) or 1:9 (U-10) with <i>Insulin Diluting Medium for NovoLog</i> : 28 days

Insulin, Mfr	Duration	Usual Frequency	Formulations/Cost ^{b,c}	Stability, in-use, room temp
Rapid-acting, continued				
<i>Apidra</i> (insulin glulisine), Sanofi-Aventis	3 to 5 hours ²	One to three (or more) times daily. ^{3,4} Inject within 15 min before a meal, or within 20 min after the start of the meal.	\$283.95/10 mL vial \$548.52/5 of 3 mL <i>SoloStar</i> pen	Vial, pen: 28 days Pump reservoir: 48 hours IV infusion: 48 hours (0.05 to 1 unit/mL in NS)
<i>Fiasp</i> (insulin aspart), Novo Nordisk Formulated with niacinamide for faster absorption. ⁷	3 to 5 hours ²	One to three (or more) times daily. ^{3,4} Inject at the start of the meal, or within 20 min after the start of the meal.	\$289.36/10 mL vial \$558.83/5 of 3 mL <i>FlexTouch</i> pen \$537.47/5 of 3 mL <i>PenFill</i> cartridge	Vial, cartridge, pen: 28 days IV infusion: 24 hours (0.5 to 1 unit/mL in NS or D5W)
<i>Lyumjev</i> (insulin lispro-aabc) Eli Lilly Formulated with treprostinil and citrate for faster absorption. ¹²	Up to ~5 hours ¹²	One to three (or more) times daily. ^{3,4} Inject within 20 minutes after the start of the meal.	\$274.7/10 mL vial \$530.40/5 of 3 mL 100 unit/mL <i>KwikPen</i> (\$106.08 each) \$424.32/2 of 3 mL <i>KwikPen</i> 200 unit/mL (\$212.16 each)	Vial, pen: 28 days Pump reservoir: 9 days IV infusion: 12 hours (1 unit/mL in NS or D5W)
Short-acting (regular): regular human insulin of rDNA origin. Available OTC (100 unit/mL only). Onset about 30 minutes (<15 min for the 500 unit/mL concentration). Longer time to onset and longer duration than rapid-acting analogues. Regardless, lag time between regular insulin administration and meals may not be necessary for all patients with type 2 diabetes . ¹ For type 1 diabetes , non-preferred alternative to rapid-acting insulin at each meal (three or more injections daily) with one or two injections of basal insulin. ⁴ For type 2 diabetes , once daily at largest meal plus basal insulin, or basal-bolus regimen (i.e., two or three times daily with meals plus basal insulin). ³ Can be given via subcutaneous injection, or intravenous infusion (100 unit/mL concentration only). Clear and colorless.				
<i>Humulin R</i> 100 units/mL , Eli Lilly	About 8 hours (longer in obese patients)	One to three (or more) times daily. ^{3,4} Inject about 30 min before the meal.	\$148.70/10 mL vial \$44.61/3 mL vial	Vial: 31 days IV infusion: 48 hours (0.1 to 1 unit/mL in NS)
<i>Humulin R</i> 500 units/mL , Eli Lilly	Mean 21 hours	Two or three times daily before a meal. Inject about 30 min before the meal.	\$1,487/20 mL vial \$287.10/3 mL <i>KwikPen</i> \$574.20/2 of 3 mL <i>KwikPen</i>	Vial: 40 days Pen: 28 days

Insulin, Mfr	Duration	Usual Frequency	Formulations/Cost ^{b,c}	Stability, in-use, room temp
Short-acting (regular), continued				
<i>Novolin R</i> , Novo Nordisk	About 8 hours	One to three (or more) times daily. ^{3,4} Inject about 30 min before the meal.	\$137.70/10 mL vial \$260.25/5 of 3 mL <i>FlexPen</i> (\$52.05 each)	Vial: 42 days Pen: 28 days IV infusion: 24 hours (0.05 to 1 unit/mL in NS, D5W, D10 with KCl 40 mEq/L)
Intermediate-acting (NPH): human insulin (rDNA origin) isophane suspension. Available OTC. For type 1 diabetes , may be used as the basal component of basal-prandial regimens (analog preferred). ⁴ An initial insulin option in type 2 diabetes , often as an add-on to oral agents. ³ As type 2 diabetes progresses, may be used with mealtime rapid- or short-acting insulin with the largest meal. ³ Onset 90 min. ² Administered via subcutaneous injection. Appears cloudy.				
<i>Novolin N</i> , Novo Nordisk	Up to 24 hours ²	Once or twice daily. ³	\$137.70/10 mL vial \$260.25/5 of 3 mL <i>FlexPen</i> (\$52.05 each)	Vial: 42 days Pen: 28 days
<i>Humulin N</i> , Eli Lilly	Up to 24 hours ²	Once or twice daily. ³	\$148.70/10 mL vial \$44.61/3 mL vial \$471.30/5 of 3 mL <i>KwikPen</i> (\$94.26 each)	Vial: 31 days Pen: 14 days
Long-acting: human insulin analogue (rDNA origin). For type 1 diabetes , preferred as the basal component of basal-prandial regimens. ⁴ An initial insulin option in type 2 diabetes , often as an add-on to oral agents. ³ As type 2 diabetes progresses, may be used with mealtime rapid- or short-acting insulin with the largest meal. ³ Administered via subcutaneous injection. Appears clear and colorless.				
<i>Basaglar</i> (insulin glargine), Eli Lilly Not a generic for <i>Lantus</i>.	~24 hours	Once daily at the same time each day.	\$326.36/5 of 3 mL <i>KwikPen</i> \$65.27/3 mL <i>KwikPen</i>	Pen: 28 days
<i>Lantus</i> (insulin glargine), Sanofi-Aventis	Median 24 hours (range 10.8 to >24 hours; sampling period 24 hours)	Once daily at the same time each day.	\$283.56/10 mL vial \$425.31/5 of 3 mL <i>SoloStar</i> pen (\$85.06 each)	Vial, pen: 28 days

Insulin, Mfr	Duration	Usual Frequency	Formulations/Cost ^{b,c}	Stability, in-use, room temp
Long-acting, continued				
<i>Levemir</i> (insulin detemir), Novo Nordisk	7.6 to >24 hours (sampling period 24 hours) (dose- dependent; binds to albumin)	Twice daily, or once daily with the evening meal or at bedtime.	\$308.14/10 mL vial \$462.21/5 of 3 mL <i>FlexTouch</i> pen	Vial, pen: 42 days
<i>Semglee</i> (insulin glargine- yfgn), ^d Mylan Specialty	At least 24 hours	Once daily at the same time each day.	\$98.65/10 mL vial \$147.98/5 of 3 mL pen (\$29.60 each)	Vial, pen: 28 days
<i>Toujeo</i> (insulin glargine), Sanofi-Aventis (300 units/mL)	>24 hours ⁸	Once daily at the same time each day. First injection may provide insufficient coverage; may take ≥ 5 days to see maximum effect.	\$388.72/3 of 1.5 mL <i>SoloStar</i> pen (\$129.57 each) \$647.87/5 of 1.5 mL <i>SoloStar</i> \$518.30/2 of 3 mL <i>Max SoloStar</i> pen (\$259.15 each)	Pen: 56 days
Ultra-Long-acting: human insulin analogue (rDNA origin). Administered via subcutaneous injection. Consider for patients with severe or nocturnal hypoglycemia on another basal analogue, or with hypoglycemia risk factors, ⁹⁻¹¹ or adherence problems. Appears clear and colorless.				
<i>Tresiba</i> (insulin degludec), Novo Nordisk	At least 42 hours	Once daily at any time of day.	\$338.95 vial (100 units/mL) \$508.43/5 of 3 mL 100 units/mL <i>FlexTouch</i> pen \$610.11/3 of 3 mL 200 unit/mL <i>FlexTouch</i> pen	Vial, pen: 56 days
Insulin Mixes: human insulin analogue (rDNA origin) solution and protamine-crystallized human insulin analogue suspension (<i>NovoLog Mix 70/30</i> , <i>Humalog Mix 75/25</i> , <i>Humalog Mix 50/50</i>). Others are human insulin (rDNA origin) solution and human insulin isophane suspension. <i>Humulin 70/30</i> and <i>Novolin 70/30</i> available OTC. Generally, not appropriate for type 1 diabetes due to lack of dose flexibility. ⁶ Typically started after failure of basal insulin plus non-insulin. ³ Usually started pre-breakfast and pre-supper. ³ Administered via subcutaneous injection. Cloudy.				
<i>NovoLog Mix 70/30</i> (70% insulin aspart protamine suspension/30% insulin aspart solution), Novo Nordisk	Up to 24 hours	Typically given pre- breakfast and pre-supper. ³ Give within 15 min before the meal, or after starting to eat (type 2 diabetes).	\$300.12/10 mL vial \$558.83/5 of 3 mL <i>FlexPen</i>	Vial: 28 days Pen: 14 days

Insulin, Mfr	Duration	Usual Frequency	Formulations/Cost ^{b,c}	Stability, in-use, room temp
Insulin Mixes, continued				
<i>Humalog Mix 75/25</i> (75% insulin lispro protamine suspension/25% insulin lispro solution), Eli Lilly (authorized generic available for 100 unit/mL pens)*	See <i>Humulin 70/30</i>	Typically given pre-breakfast and pre-supper. ³ Give within 15 min before the meal.	\$284.70/10 mL vial \$265.20*/5 of 3 mL <i>KwikPen</i> (\$53.04* each)	Vial: 28 days Pen: 10 days
<i>Humalog Mix 50/50</i> (50% insulin lispro protamine suspension, 50% insulin lispro solution), Eli Lilly	>22 hours	Typically given pre-breakfast and pre-supper. ³ Give within 15 min before the meal.	\$284.70/10 mL vial \$530.40/5 of 3 mL <i>KwikPen</i> (\$106.08 each)	Vial: 28 days Pen: 10 days
<i>Humulin 70/30</i> (70% NPH/30% regular), Eli Lilly	Mean about 23 hours (range: 18 to 24 hours)	Typically given pre-breakfast and pre-supper. ³ Give about 30 to 45 min before the meal.	\$148.70/10 mL vial \$44.61/3 mL vial \$471.30/5 of 3 mL <i>KwikPen</i> \$94.26/3 mL <i>KwikPen</i>	Vial: 31 days Pen: 10 days
<i>Novolin 70/30</i> (70% NPH/30% regular), Novo Nordisk	Up to 24 hours	Typically given pre-breakfast and pre-supper. ³ Give about 30 min before the meal.	\$137.70/10 mL vial \$260.25/5 of 3 mL <i>FlexPen</i> (\$52.05 each)	Vial: 42 days Pen: 28 days

- Product information used in creation of this chart:** *Admelog* (December 2020), *Humalog* (November 2019), *NovoLog* (March 2021), *Apidra* (December 2020), *Fiasp* (December 2019), *Lyumjev* (August 2021), *Humulin R* 100 units/mL (November 2019), *Humulin R* 500 units/mL (November 2019), *Novolin R* (November 2019), *Novolin N* (November 2019), *Humulin N* (November 2019), *Basaglar* (July 2021), *Lantus* (January 2021), *Levemir* (March 2020), *Semglee* (July 2021), *Toujeo* (December 2020), *Tresiba* (November 2019), *NovoLog Mix 70/30* (April 2021), *Humalog Mix 75/25* (November 2019), *Humalog Mix 50/50* (November 2019), *Humulin 70/30* (November 2019), *Novolin 70/30* (November 2019).
- Wholesale acquisition cost (WAC), for generic if available. Medication pricing by Elsevier, accessed August 2021.
- Where prices are specifically listed for “each” pen or cartridge, this indicates that cartridges or pens can be purchased individually, not just in quantities of two, three, or five as packaged.
- Semglee* (insulin glargine-**yfgn**): Pharmacists may automatically substitute for *Lantus* in many states (interchangeable biosimilar).⁵ See our *Facts About Biosimilars* for more information.

Users of this resource are cautioned to use their own professional judgment and consult any other necessary or appropriate sources prior to making clinical judgments based on the content of this document. Our editors have researched the information with input from experts, government agencies, and national organizations. Information and internet links in this article were current as of the date of publication.

References

1. Muller N, Frank T, Kloos C, et al. Randomized crossover study to examine the necessity of an injection-to-meal interval in patients with type 2 diabetes and human insulin. *Diabetes Care* 2013;36:1865-9.
2. Clinical Pharmacology powered by Clinical Key. Tampa (FL): Elsevier. 2021. <http://www.clinicalkey.com>. (Accessed August 5, 2021).
3. American Diabetes Association. Standards of medical care in diabetes – 2021. *Diabetes Care* 2021;44(Suppl 1):S1-232.
4. Chiang JL, Kirkman MS, Laffel LM, et al. Type 1 diabetes through the life span: a position statement of the American Diabetes Association. *Diabetes Care* 2014;37:2034-54.
5. FDA. FDA approves first interchangeable biosimilar insulin product for treatment of diabetes. July 28, 2021. <https://www.fda.gov/news-events/press-announcements/fda-approves-first-interchangeable-biosimilar-insulin-product-treatment-diabetes>. (Accessed August 9, 2021).
6. Diabetes Canada Clinical Practice Guidelines Expert Committee. Diabetes Canada 2018 practice guidelines for the prevention and management of diabetes in Canada. *Can J Diabetes* 2018;42(Suppl 1):S1-S325.
7. Kildegaard J, Buckley ST, Nielsen RH, et al. Elucidating the mechanism of absorption of fast-acting insulin aspart: the role of niacinamide. *Pharm Res* 2019;36:49.
8. Becker RH, Nowotny I, Teichert L, et al. Low within- and between-day variability in exposure to new insulin glargine 300 U/mL. *Diabetes Obes Metab* 2015;17:261-7.
9. Marso SP, McGuire DK, Zinman B, et al. Efficacy and safety of degludec versus glargine in type 2 diabetes. *N Engl J Med* 2017;377:723-32.
10. Lane W, Bailey TS, Gerety G, et al. Effect of insulin degludec vs insulin glargine U100 on hypoglycemia in patients with type 1 diabetes: the SWITCH 1 randomized clinical trial. *JAMA* 2017;318:33-44.
11. Wysham C, Bhargava A, Chaykin L. Effect of insulin degludec vs insulin glargine U100 on hypoglycemia in patients with type 2 diabetes: the SWITCH 2 randomized clinical trial. *JAMA* 2017;318:45-56.
12. Linnebjerg H, Zhang Q, LaBell E, et al. Pharmacokinetics and glucodynamics of ultra rapid lispro (URLi) versus *Humalog* (lispro) in younger adults and elderly patients with type 1 diabetes mellitus: a randomised controlled trial. *Clin Pharmacokinet* 2020;59:1589-9.

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