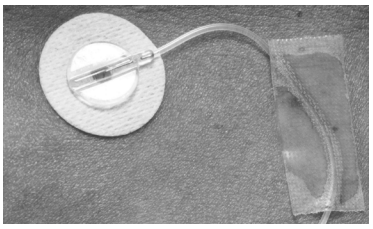
| 14.1 Infusion Line Occlusion | | |
|---|---|---|
| **Problem** | **Causes** | **Solutions** |
| An occlusion alarm sounds when a cannula kinks or insulin crystallization blocks a cannula or infusion line. | A rough or defective infusion set wall, a defective connector, a kinked cannula, bad insulin, or exposure of insulin to excess heat or cold. | Remove the Teflon cannula or metal needle and give a 3 unit bolus. If insulin is not visible, the problem is a kink in the cannula or the infusion set. Refill the cartridge from a new insulin bottle, and replace the infusion set. |
| **A Pump Alarms with Complete Blockage** | | |

| 14.2 What Insulin Smells Like |
|---|
| Insulin has a distinctive odor from the m-creosol and phenol that help stabilize the insulin molecule and act as anti-bacterial agents. The odor is often described as smelling like creosote, railroad ties, or Band Aids. If you smell an odor like this, insulin is leaking somewhere. |

| 14.3 Leaks and Detached Sets | | |
|---|---|---|
| **Problem** | **Causes** | **Solutions** |
| **Complete or partial detachment of the infusion set or pod.** | **Set comes loose from sweat or tugs, lack of tape on infusion line, or a problem during insertion.** | **Look for loose set, dampness, or the smell of insulin. Replace the infusion set or pod. Anchor the infusion line. Switch to a different infusion set if problem continues.** |
| Hole in the infusion line. | Puncture from a pet or sharp object. | Give a bolus, then feel and look for damage or an insulin leak along the line. Replace the infusion set. |
| Infusion line connection is leaking at infusion set or cartridge hub. | Connection is not fully engaged at the site or hub, or the hub is overtightened causing a crack. | Feel and smell for insulin at hub and site. Check for a crack in the hub. If loose, retighten. Otherwise, replace cartridge and infusion set. |
| Seal between the O-rings and cartridge wall lets insulin leak backward. | When cartridges sit for some time, O-ring lubricant pools at the bottom of the cartridge. | Replace cartridge and move O-rings back and forth before drawing up insulin. Inserting cartridge carefully into the pump. |
| **For these, your pump will NOT alarm.** | | |

**Fig. 14.4 Anchoring Helps**



Anchor the infusion line with tape to significantly reduce set failures.

**14.5 Tunneling**

| About | Causes | Solutions |
|---|---|---|
| The glucose rises higher than normal if insulin leaks from the end of a cannula or metal needle back to the skin. More common in 90 degree Teflon cannulas when no tape is used to anchor the infusion line. | Bumps or movement of the infusion set loosen contact between Teflon cannula and surrounding tissues, opening a path for insulin to escape back to the skin surface. | Use infusion sets no longer than 3 to 4 days. Always anchor infusion lines with 1" tape to the skin. Replace the infusion set and anchor it. |
| **Will Pump Alarm? No** | | |

**14.6 Is It Bad Insulin?**

Insulin going bad is rare. Suspicion should arise if you experience unexplained highs that do not correct when you change your infusion set, but do correct when a new bottle of insulin is used. Exposure to excess sunlight, heat, or cold can cause insulin to go bad. The insulin inside a pump on your body does not get hot or cold enough to damage it. Exposure to extreme temperatures is required to damage insulin. These temperatures may result during shipping or from being left in a hot car or stored inside a refrigerator below 36° F (2° C) at your pharmacy or home. A vial of insulin can be stored at room temperature for at least 30 days without any problem.

To check for bad insulin, check the insulin's expiration date. Then grasp the bottle by the neck, turn it upside down, and swirl it a few times against a light background. If you see any cloudiness or tiny particles that fall or attach themselves to the inside wall of the bottle, your insulin is likely bad. These particles are quite small and hard to see. Good insulin appears as clear as water. If you have any question about your insulin's potency, replace your cartridge and infusion set immediately and use a new bottle of insulin, preferably with a different lot number.

## 14.7 Tips for Skin Allergies from Infusion Set and Sensor Adhesives

Two quick things to try:

- 3M's Cavalon No-Sting Barrier Film as a first barrier, and then a hydrocolloid adhesive like CVS Advanced Healing Hydrocolloid Bandages, both under the sensor.
- 28 ml bottle of 3M™ (or Solventum) Cavilon™ No Sting Barrier Film. Apply lightly to skin and let dry for 90 seconds before applying Hydrocolloid Bandage and inserting infusion set or CGM sensor. 60 days, 6 refills. Available as a spray or with an applicator.
- CVS Health Advanced Healing Hydrocolloid Bandages. Cut a hole in the bandage for the sensor or infusion needle, apply it on top of the No Sting Barrier, and insert the sensor infusion set. Dispense 15 four-packs, 6 refills.
- Visit www.woundsource.com/product-category/skin-care/liquid-skin-protectantssealants for various skin protectors and barriers

Also check out the "Dexcom and Libre Rash" group on Facebook that offers multiple discussions and solutions.

## 14.8 Rapid Lowering of Glucose May Temporarily Worsen Retinopathy

Suppose your average glucose level has been high for months or years. In that case, rapid lowering of glucose can temporarily increase VEGF (vascular endothelial growth factor) levels, causing existing retinopathy to worsen.[101-103] Higher VEGF may increase proliferative retinopathy (growth of new weaker blood vessels into the clear vitreous of the eye), and macular edema (swelling in the central vision area from leaky blood vessels).104 To avoid this, your physician may advise you to gradually lower your glucose over a few weeks to minimize VEGF release.

Injection of a prescription VEGF inhibitor is highly effective in protecting vision. For broader vascular support, some over-the-counter supplements may help. High doses of vitamin E (1,600 to 2,000 units a day), two 500 mg rutin capsules, or two omega-3 capsules have been shown to significantly lower systemic VEGF levels.[105-108] Once vitamin E collects a free radical and oxidizes, vitamin C and glutathione clear vitamin E back to a protective form. When using vitamin E, take some vitamin C and 600 to 1,000 mg of N-acetyl cysteine twice a day or one bottle of a hundred 200 mcg of selenium tablets once a day to maintain healthy glutathione levels.

Bringing glucose levels to target goals for 6 to 12 months stabilizes vision. Work with your ophthalmologist and diabetes specialist to ensure that bringing a high average glucose down does not worsen existing eye damage. You may want to gradually lower a high average glucose by multiplying your current average TDD by 1.06 once a month until you are at goal. This lowers your average glucose by about 25 mg/dL a month.