Assembly for needle (solenoid valve)

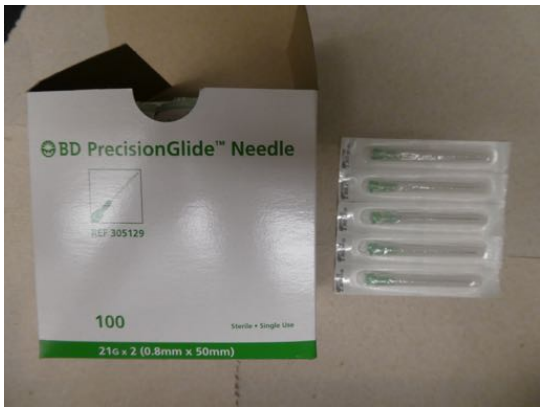
What you will learn: Cutting the hypodermic needles with a Dremel and fitting them with Luer Lock Adapters and tubing

Introduction:

To dispense the "reward" for our operant boxes, we used solenoids from the *Lee Company* and 21G hypodermic needles (which are often found in lab settings) as spouts. This section will walk you through the steps on how to attach the needles to the solenoids.

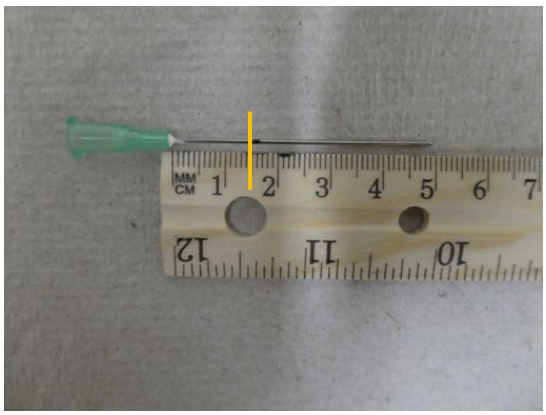
Steps:

1) Get a 21G Needle (0.8mm x 50mm) – We used this gauge because it was a medium sized gauge needle that we thought would closely resemble the water spouts often found in rodent cages. You can definitely use other size needles – just make sure to calculate how much liquid is dispensed as a function of time the solenoid is powered on.



Step 1: Get 21G hypodermic needles

2) Mark off 1.5cm from the base of the needle (orange line). Always measure a little bit more than 1.5cm with a thick sharpie since manually operated Dremel tend to be imprecise.



Step 2: Mark off 1.5 cm from the base of the needle

3) With a Dremel fitted with an EZ Lock **metal** cutting wheel, cut it off at the Sharpie marking

SAFETY NOTE:

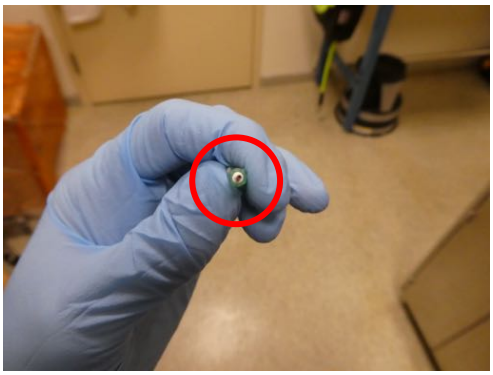
When you cut off the needles at the marking, you'll have the other end of the needle which is still pointy. Make sure to dispose of them properly in the sharp's container!! The sharp needles can seriously hurt someone if disposed improperly.

Figure 1: Red Sharps Container in the background

Figure 2: Properly disposing the sharp ends into the sharp's container.

4) After you make the cut, sand down the needle tip with a belt grinder. We're lucky to have one at the machine shop, but if you don't have one, you can use a filer or other sand paper. This is to not only make the needles blunter for safety reasons but also to increase liquid flow within the spout (needle).

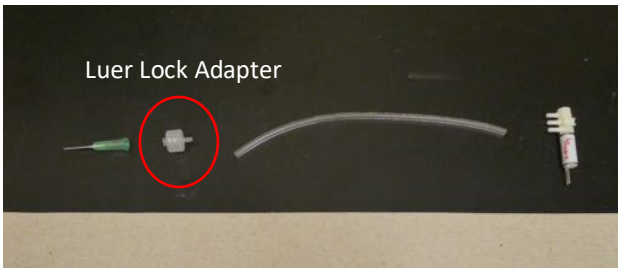
Step 4: Using the belt grinder



Step 4 – 2: (It is a bit hard to see, but the tip of the needle is sanded down. (Red Circle)

5) Assemble the needle with Luer Lock adapter and tubing. The length of tubing (ID: 1/16" – refer to "Bill of Materials" for exact tubing used) for the solenoid needle should be around 9

cm. This is to minimize the kinking and to make the final box look neater. More explanation on this later in the "Final Assembly" section. To give yourself a little wiggle room however, always cut **more** than 9cm since you can always cut down the length but can't extend it. The other end of the tubing should be fitted to the middle port of the solenoid valve. Explanation on why it should go into the middle port can be found in the "Solenoid Valves" section.



Step 5: From Left to Right: Needle, Luer Lock adapter, Tygon E-3603 Tubing (ID: 1/16", OD: 1/8"), Solenoid Valve

Step 5 – 2: The other end of the tubing should fit onto the middle port of the solenoid valve.