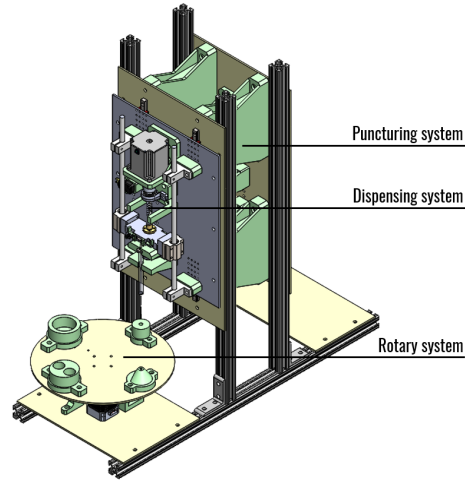


(a)



(b)



(c)

Figure 1. (a) Visual of the dispensing system prototype (b) CAD model of the complete system (c) QR code with link to prototype mechanism videos

Precision Dispensing System for Iodine-131 Radiopharmaceutical Pill

Client: ISOLOGIC

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Supervisor: Prof. Eric Diller

Can radiopharmaceuticals be dispensed with more precision and accuracy?

ISOLOGIC is a radiopharmaceutical company that uses a peristaltic pump to dispense radioactive Iodine-131 solution into pills remotely. Due to the presence of changing flow rates, turbulent flow, and the degradation of pump tubes causing leaks, the existing design is inaccurate when dispensing Iodine-131. The result in multiple dispensing attempts required to achieve an accurate amount of solution causes pill defects due to the reinjection of the needle and introduces variability in the overall manufacturing process. The client approached the team to design a mechanism that can reliably dispense between 0.3-170uL of solution with +/- 6% precision on the first attempt. The design will eventually be used to help in the rapid production of Iodine -131 pills for patients across Canada.

A cost-effective, precise linear dispensing system

The design uses a linearly-actuated syringe to control the dispensing of Iodine-131 instead of the current peristaltic pump. The team decided to utilize simple mechanisms and an off-the-shelf, modular design to reduce potential failure modes. The prototype will demonstrate the feasibility of the design and remote actuation of the dispenser.

Key Design Features

- Dispensing system prototype has been verified using UV-spectrometry that it can dispense on average a minimum volume of 0.16uL with +/- 14% precision
- Dispensing precision is controlled by a Nema 23 stepper motor driving a lead screw linearly by 0.7874 mm for each full rotation of the motor to move a 250uL-volume syringe plunger
- Rotary and puncturing systems transports the syringe, pill, and bulk solution as required
- Remote access using manipulator arms to remove/replace needle and syringe when needed