KidneyLoop: Home Build Guide

Overview

KidneyLoop is a closed-loop water purification system using shallow UV-C exposure and a 0.1 micron physical filter. This guide explains how to build a functional at-home version using readily available components.

Components List

- UV-C LED Strip or UV-C Lamp (260-280 nm range)
- Shallow plastic or glass tray (UV transparent)
- 0.1 micron ceramic or polymer filter (inline or gravity style)
- Submersible DC water pump (low-flow)
- Tubing (food-grade silicone or vinyl)
- 12V DC power supply or solar panel with battery
- 5-gallon water reservoir (inlet)
- 5-gallon clean water tank (output)
- Optional: Microcontroller (for automation), flow sensor, timer relay

System Layout

1. Water is pulled from the dirty source tank into the shallow UV-C tray using a small pump.
2. While passing through the tray, it is exposed to UV-C light for microbial sterilization.
3. The water is then piped through a 0.1 micron filter which removes physical particles and UV-inactivated organisms.
4. Clean water flows into the output tank. The system can run on a timer or be cycled continuously using solar or battery power.

Build Instructions

Step 1: Place your dirty water reservoir slightly elevated from the tray.
Step 2: Mount the UV-C strip under or over the shallow tray, ensuring maximum exposure over a few seconds.
Step 3: Connect the pump output to the tray inlet. Use tubing to direct water through the filter after UV treatment.
Step 4: Secure the filter inline and ensure a clean exit to the output tank.
Step 5: Power the system using a 12V DC adapter or small solar setup with charge controller.
Step 6: Optionally connect a microcontroller (Arduino, ESP32) to cycle the pump based on flow rate or time.

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Safety Considerations

- Never look directly at UV-C light.
- Enclose or shield the light system to prevent accidental exposure.
- Ensure your components are food-safe (BPA-free plastic or stainless steel).
- Routinely clean the tray and filter to maintain efficiency.
- Monitor flow rate to ensure sufficient UV dwell time (minimum 3-5 seconds exposure).

Performance Tips

- Keep the UV tray shallow (~1 cm depth) to increase kill rate.
- Adjust flow rate for dwell time; slower is safer.
- Consider parallel filtration to reduce pressure drop.
- Pre-filter with mesh if the source is very turbid.
- For off-grid, use a small solar panel plus battery system.

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