# Diagnose the ZOMBIE

# Using Paper-Based Diagnostic Devices

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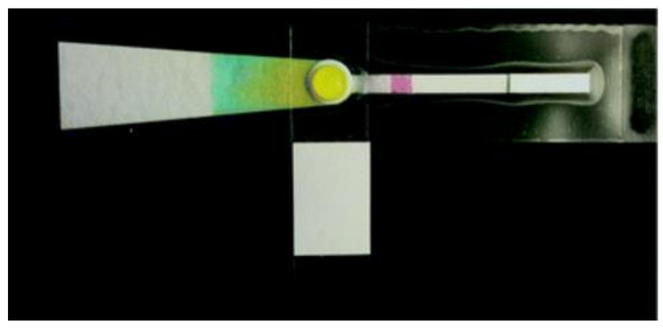
## What are Paperfluidic Diagnostic Devices?

Paperfluidic molecular diagnostic devices take advantage of paper's ability to wick liquids by **capillary action**. The paper absorbs fluid without needing external pumps or energy, making the tests **cheaper, faster, and easier** to use in doctor's offices, clinics, or in the field.

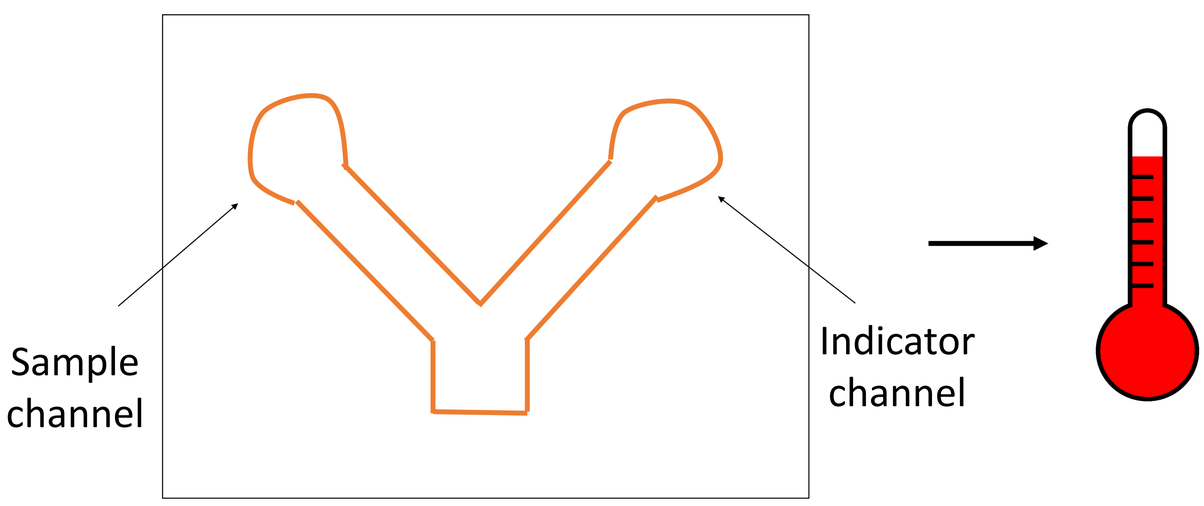
## How do Paperfluidic Devices Work?



(1) Introduce patient sample to the device
(2) Add lysis solution to break open cells and capture DNA
(3) Add enzymes and apply heat to amplify the DNA
(4) Add buffer to flow the sample onto a flow strip to detect the DNA

## The Activity: Paper-Based Diagnosis of ZOMBIES

*Help! There's a Zombie Apocalypse coming—and some of our citizens have been infected! Our testing lab has received patient samples and we have to figure out which patients have been infected with the **zombie virus!***




**Zombie! Reaction turned pink!**

**Normal human--No color change!**

### *Make the Device:*

(1) Using a crayon, draw a sample chamber with two different channels—one for the indicator and one for the sample.

(2) Place your design on a hot plate to melt the wax. The wax from the crayon provides a **hydrophobic barrier** which keeps the liquid within the channels.

### *Test the Samples:*

(1) Add your indicator dye to the right sample channel
(2) Add your unknown sample to the left channel
(3) Watch the liquids mix together and wait for a color change!

If the sample turns **pink**, we have a zombie!!!

**References:**

1. A fully integrated paperfluidic molecular diagnostic chip for the extraction, amplification, and detection of nucleic acids from clinical samples. NM Rodriguez, et. al - Lab on a Chip, 2016
2. Lab-on-a-chip workshop activities for secondary school students. Esfahani MMN, Tarn MD, Choudhury TA, et al. *Biomicrofluidics*, 2016

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