

Tiny Isothermal Nucleic acid quantification sYstem for wastewater (TINY)

Tiny Isothermal Nucleic acid quantification sYstem

Cornell University, Sibley School of Mechanical and Aerospace Engineering and Weill Cornell Medical College

Size – 12.4 cm (h x w x l), 6 sample capacity

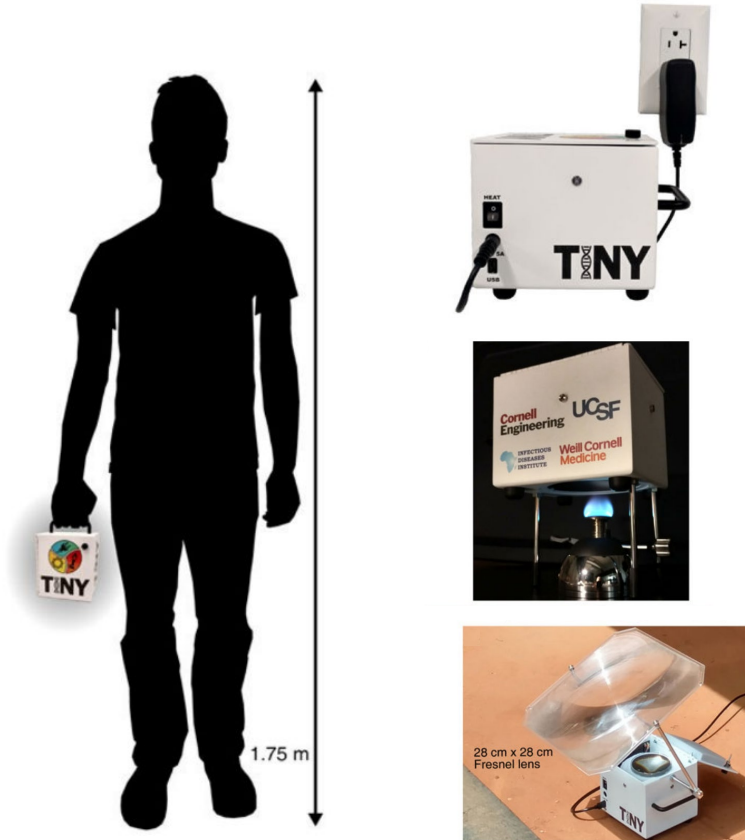
Maintains a temperature for ~65 minutes

TINY is composed of two units:

1. *measure unit*
2. *temperature regulation unit*
 - a. *composed of*
 - i. *phase change material (PCM) – PureTemp 68 (Entropy Solutions) has melting T_m of 68C*
 - ii. *concentric aluminum cylinder with PCM in between each layer*
 - b. *can be heated by*
 - i. *top – sunlight through Fresnel lens*
 - ii. *bottom – Bunsen burner*
 - iii. *electrical outlet (12V 5A)*

Excitation – 3 led (Evagreen/blue, ROX/yellow, Turbidity/red)

Detection – photodiodes with 2 band-pass filters (green/530 center, red/660 center)



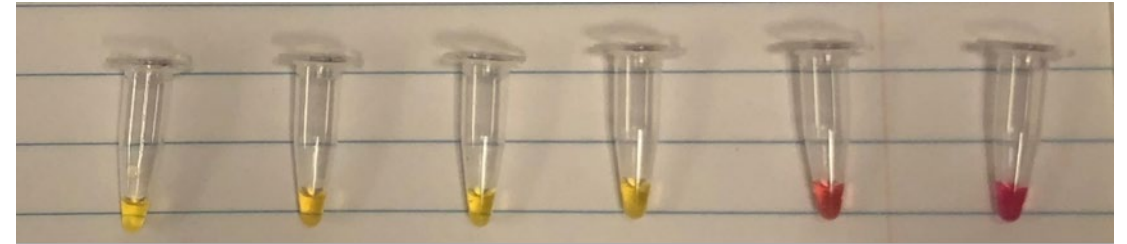
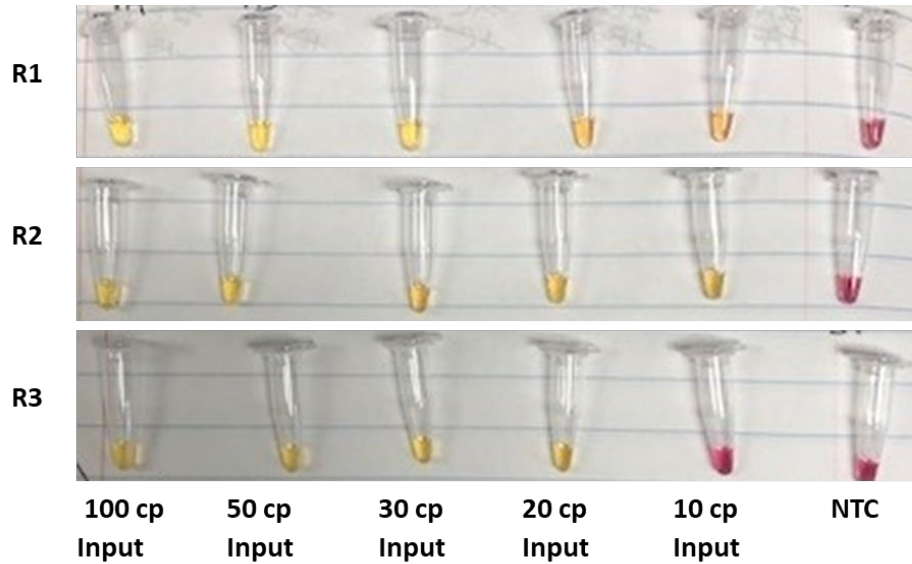
A portable device for nucleic acid quantification powered by sunlight, a flame or electricity

Ryan Snodgrass¹, Andrea Gardner², Aggrey Semeere³, Varun Koppa¹, Jens Duru¹, Toby Maurer⁴, Jeffrey Martin^{5,*}, Ethel Cesarman^{2,*}, and David Erickson^{1,*}

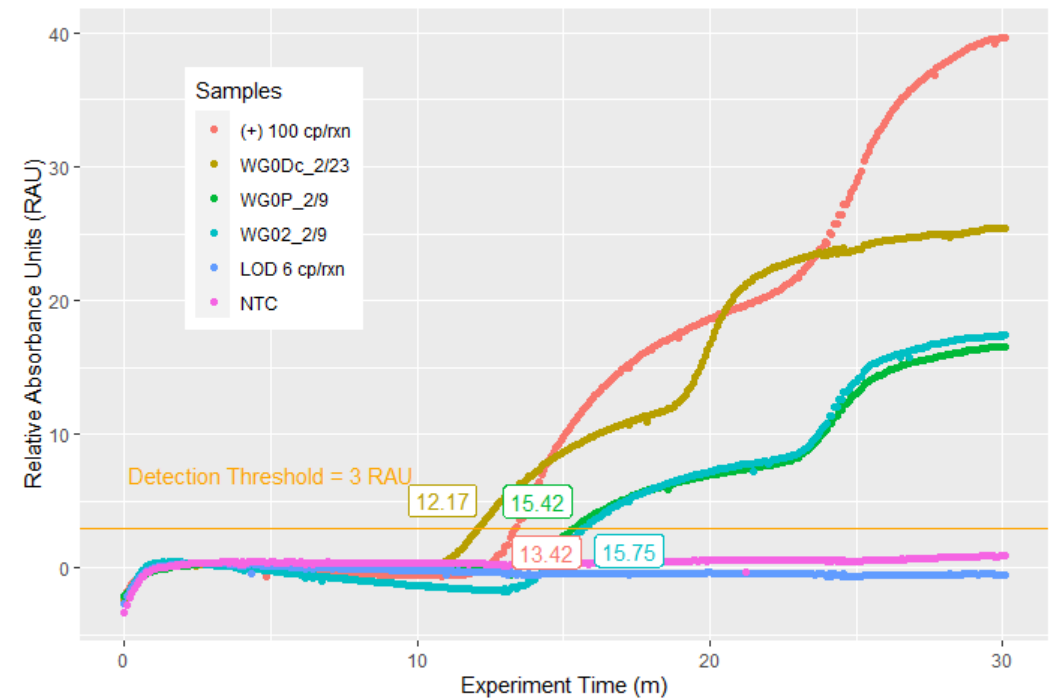
Nat Biomed Eng. 2018 September ; 2(9): 657–665. doi:10.1038/s41551-018-0286-y.

NEB SARS-CoV-2 Rapid Colorimetric LAMP Assay Kit

- Isothermal LAMP assay 30-minute reaction 65C
- Colorimetric assay, pink to yellow color change
- UDG and dUTP master mix to reduce carry over
- Combined N and E region targets
- 2 ul input volume



Positive Control (100 cp / 2 uL) Community Scale Sample Building Scale Sample Cluster Scale Sample Lower Limit (6 cp / 2 uL) NTC

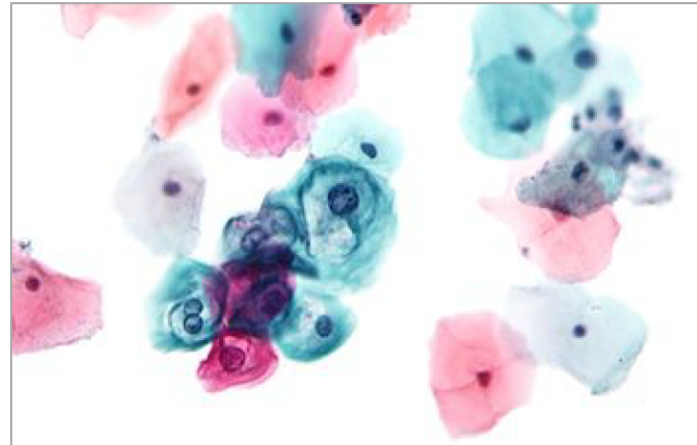


Nanotrap[®] Technology

A proven technology...

Histology

- High affinity dyes clearly define cellular components

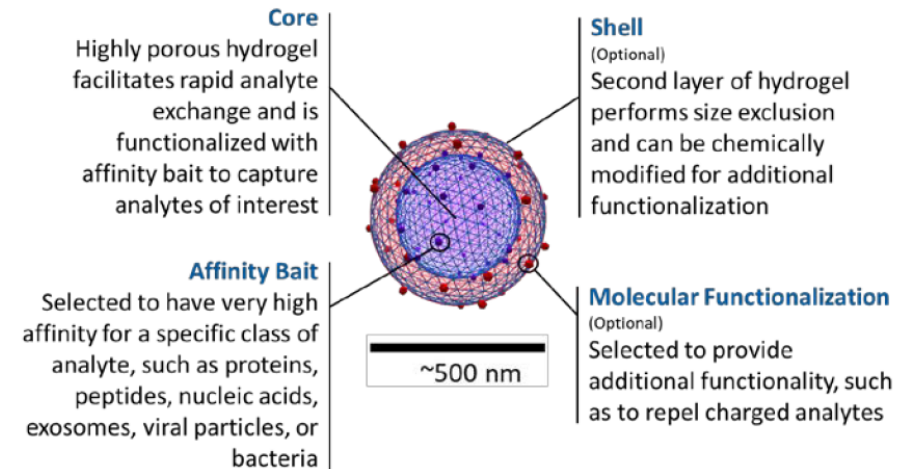


Papanicolaou stain: multichromatic staining technique, widely used to aid pathologists in making a cancer diagnosis.

redeployed in engineered hydrogel particles

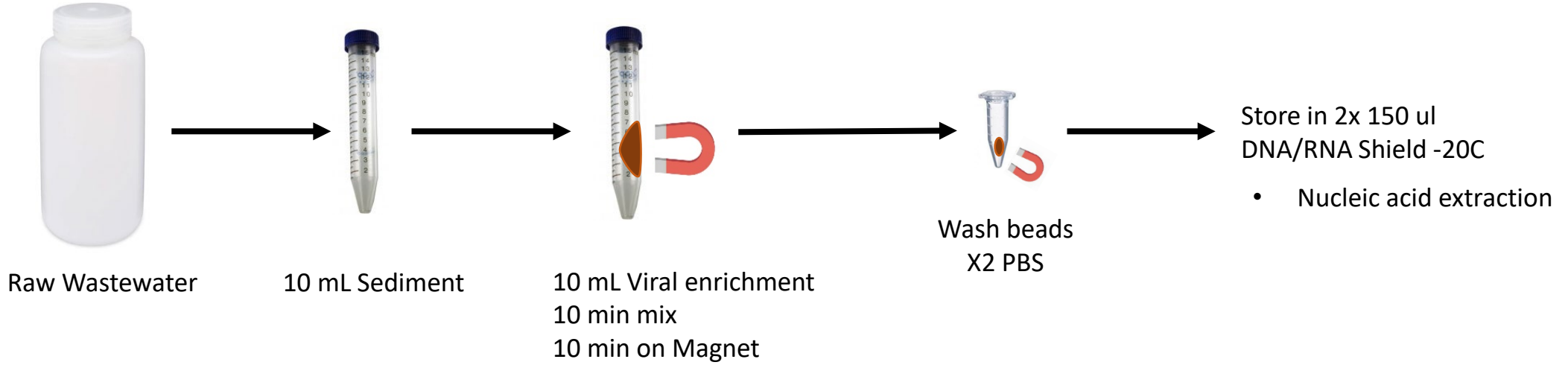
Nanotrap[®] Technology

- Affinity dye captures low abundance analytes
- Hydrogel particle structure enables size exclusion and rapid analyte binding



Technology supported by over 40 publications and 14 patents issued in the United States, European Union, Japan, and Canada.

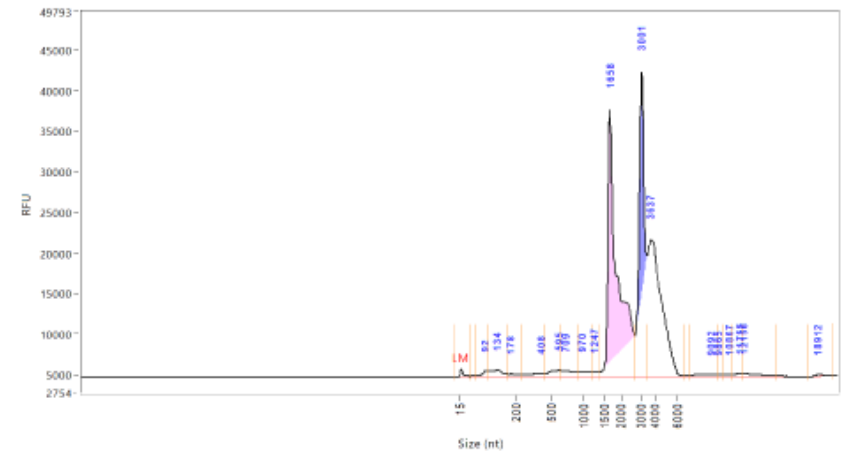
Basic Workflow



DynaMag 50 ml



Fragment
Analysis
(RQN 10)

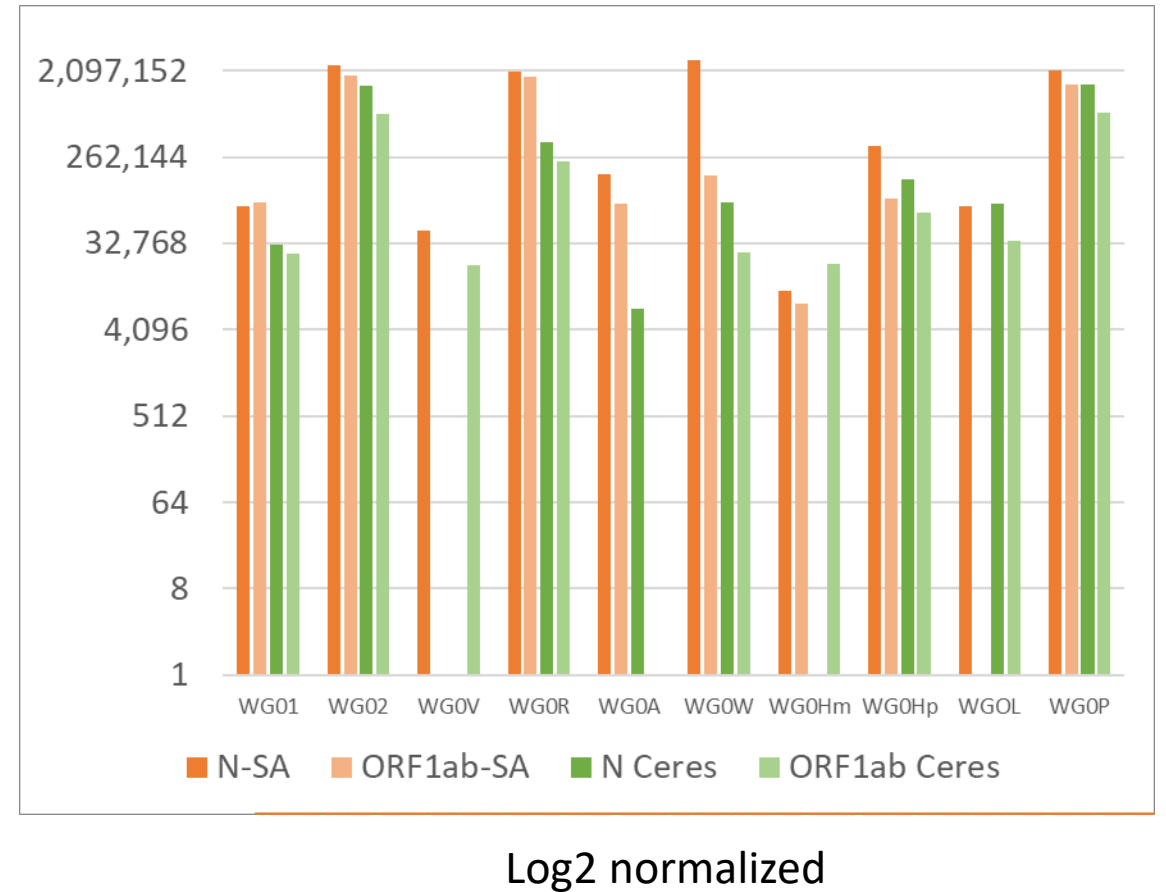


End to end comparisons

1. UMiami Zymo to V2G
2. Umiami Thermo MagMax to PE EUA rt-qPCR
3. Commercial qPCR
4. Umiami Ceres + Roche to PE EUA rt-qPCR



Thermo/ PE vs Ceres/PE



Thank You

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A Cancer Center Designated by the
National Cancer Institute