

## Supplementary Information

### Thread integrated smart-phone imaging facilitates early turning point colorimetric assay for microbes

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	<b>Organism</b>	<b><math>\alpha</math></b>	<b><math>\beta</math></b>	<b><math>\lambda</math></b>
<b>Thread without storage</b>	<i>Candida albicans</i>	21	16	$4 \times 10^{-5}$
	<i>E. Coli</i>	21	16	$4 \times 10^{-5}$

**Supplementary Table 1:** Image analysis parameters (Refer Equation 2 and 3).

<b>Thread-based devices &amp; Smart-Phone imaging</b>				
<b><i>Candida albicans</i> : Detection time (mins)</b>				
<b>Trial</b>	<b>Glucose</b>	<b>Sucrose</b>	<b>Maltose</b>	<b>Lactose</b>
<b>1</b>	600	--	720	--
<b>2</b>	630	--	840	--
<b>3</b>	600	--	750	--

**Supplementary Table 2:** Detection time of colorimetric assay (3 trials) for *Candida albicans* using thread-devices and Smart-Phone imaging.

<b>Thread-based devices &amp; Smart-Phone imaging</b>				
<b><i>Escherichia coli</i> : Detection time (mins)</b>				
<b>Trial</b>	<b>Glucose</b>	<b>Sucrose</b>	<b>Maltose</b>	<b>Lactose</b>
<b>1</b>	90	--	120	120
<b>2</b>	120	--	90	210
<b>3</b>	90	--	120	150

**Supplementary Table 3:** Detection time of colorimetric assay (3 trials) for *Escherichia coli* using thread-devices and Smart-Phone imaging.

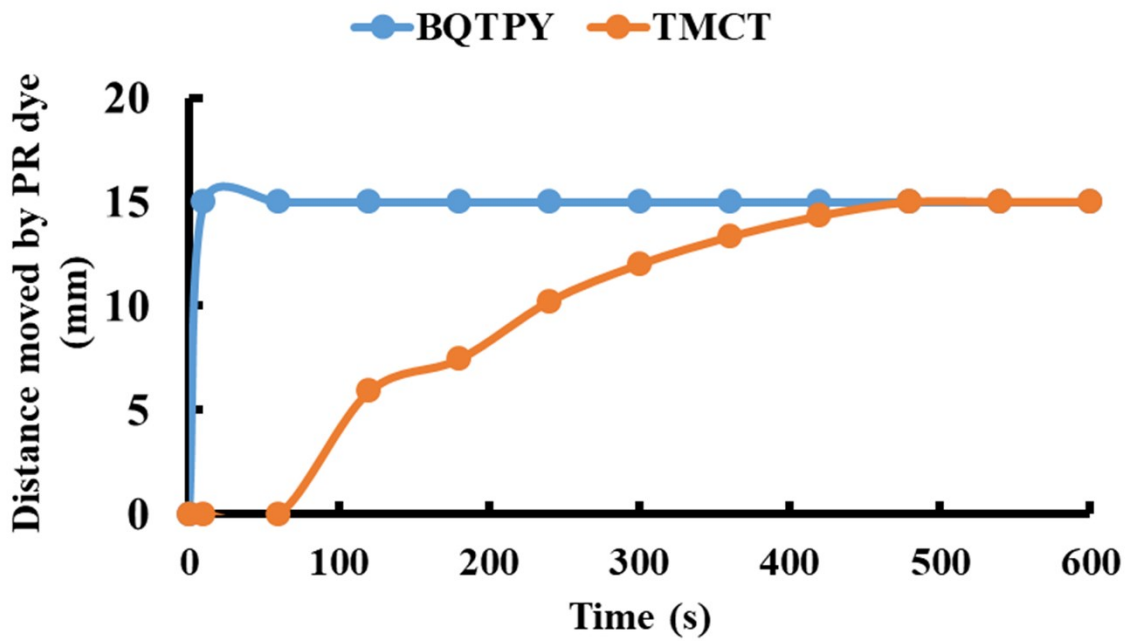


Fig S1: Penetration rate of Phenol Red dye in Best quality twisted polyester yarn and Twisted multifilament cotton thread.

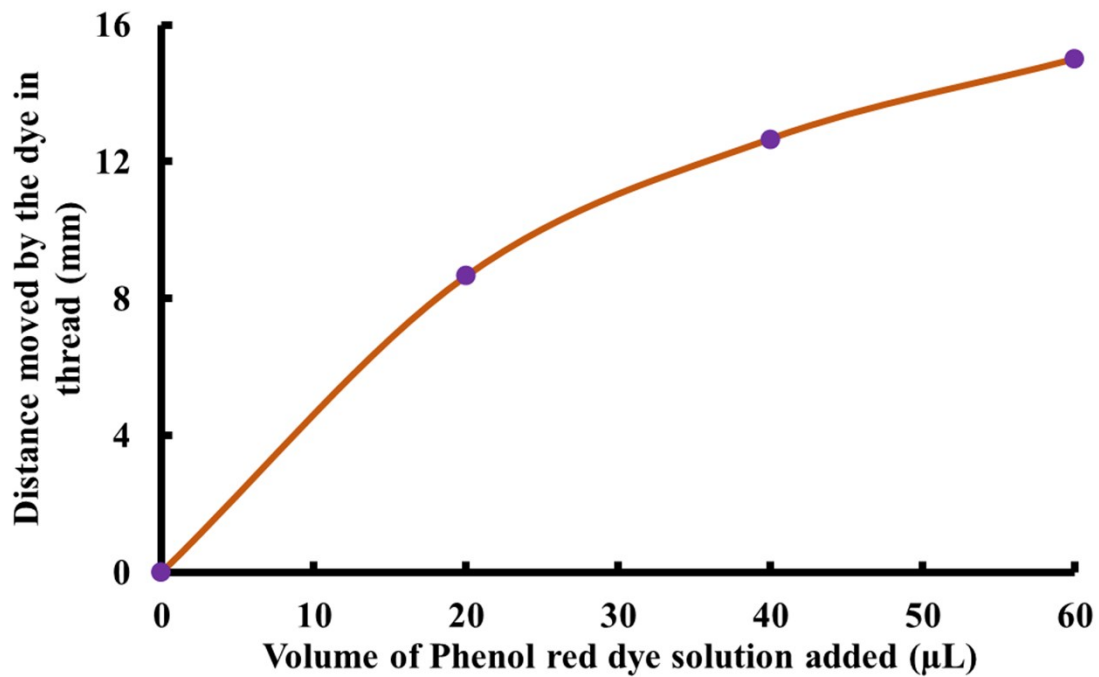


Fig S2: Volume of Phenol Red dye consumed by 15 mm of “Twisted multifilament cotton thread”.

### Thread with phenol red indicator with different pH



pH 6.5



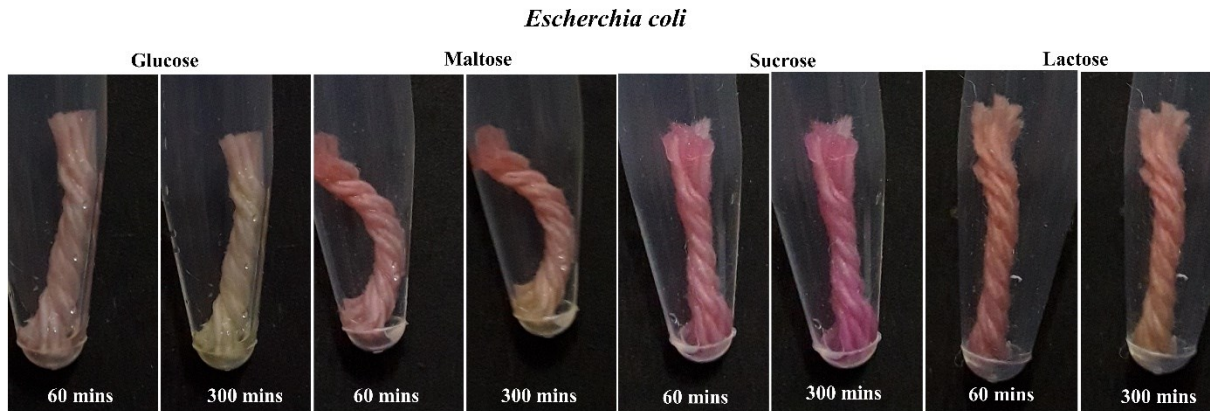
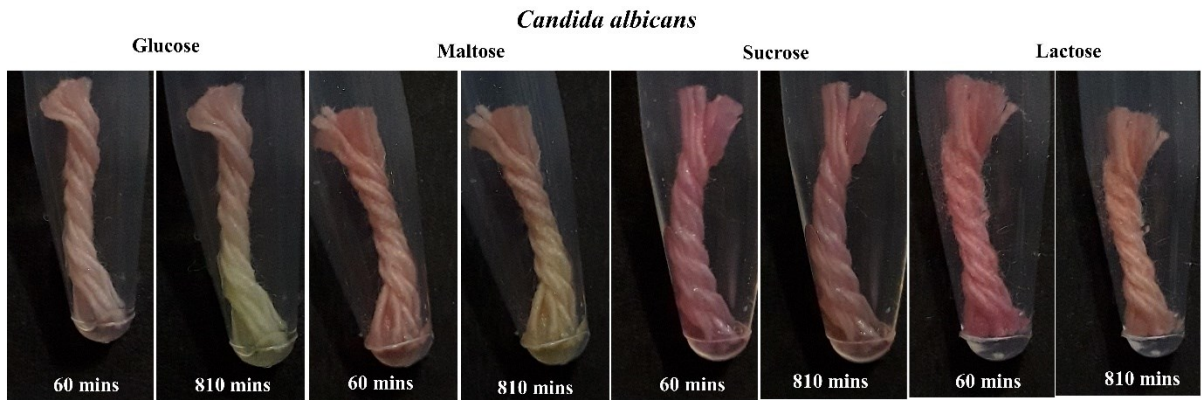
pH 7



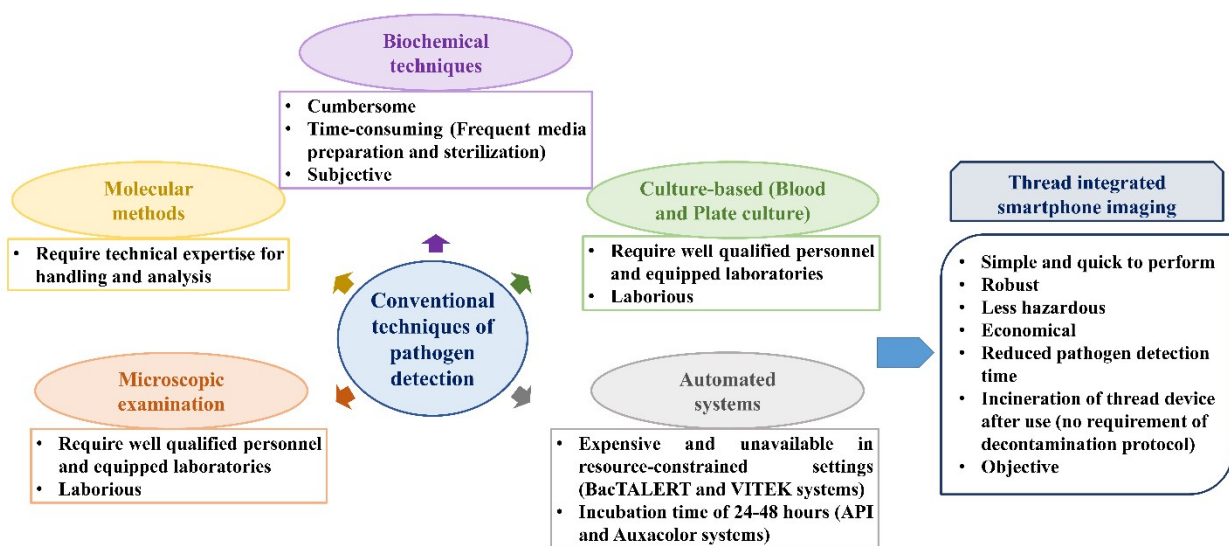
pH 7.4

**Fig S3:** Color change in threads for different pH solution (Thread contents: Media, Phenol red, Standard pH solution).

Threads stored for 20 days (with imbibed media):



**Fig S4:** Thread-based colorimetric assay of *Candida albicans* and *Escherichia coli* in stored thread device (4°C for 20 days) (a) Glucose (b) Sucrose (c) Maltose (d) Lactose. Yellow colour depicts positive, Red colour depicts negative.



**Fig S5:** Outline of existing methods and thread-based method of microbial identification

**Future Work for colorimetric detection:**

A main challenge in threshold based colorimetric detection is determining the optimal threshold parameter. Experimentation has to be cautiously performed to determine the threshold parameter. A minor experimentation error (due to artefacts) may result in a deviated positive value, as was the case observed in the initial trails of *Candida albicans*. In future, such cases can be addressed by using calibrated color imaging processing techniques, which would eventually reduce the influence of threshold parameter for developing a more efficient system with increased specificity and sensitivity.

