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SIMPLE POINT OF CARE MICROFLUIDIC DEVICE FOR DETECTION OF TUBERCULOSIS (T.B)

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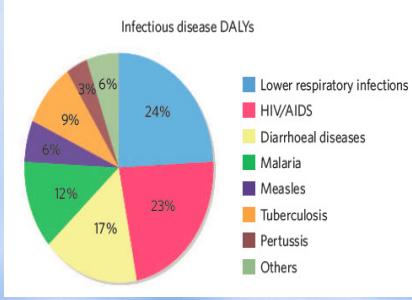
Abstract
Nano/microfluidic technologies are emerging as powerful enabling tools for diagnosis and monitoring of infectious diseases in both developed and developing countries. Miniaturized nano/ microfluidic platforms that precisely manipulate small fluid volumes can be used to enable medical diagnosis in a more rapid and accurate manner. In particular, these nano/microfluidic diagnostic technologies are potentially applicable to global health applications, because they are disposable, inexpensive, portable, and easy-to-use for detection of infectious diseases

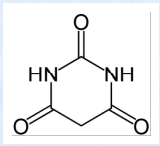
Introduction
Many developing countries do not have access to the best medical diagnostic technologies. These medical devices are designed for air-conditioned laboratories, refrigerated storage of chemicals, a constant supply of calibrators and reagents, stable electrical power, highly trained personnel and rapid transportation of samples. Micro-fluidic systems designed today allow miniaturization and integration of complex functions, which could move sophisticated diagnostic tools out of the developed-world laboratory. These systems must be inexpensive, but also accurate, reliable, rugged and well suited to the medical and social contexts of the developing world.

Purpose
Micro-fluidic systems can be designed to obtain and process measurements from small volumes of complex fluids with efficiency and speed. set of capabilities is precisely what is needed to create portable point-of-care (POC) medical diagnostic systems.1,2 The world's population of 6.1 billion people, 3 billion lack basic sanitation, 2 billion do not have access to electricity and more than 1 billion lack basic healthcare services and clean drinking water5,6.

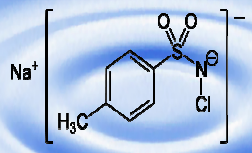


improved POC methods are needed to return same-day test results so that patients can receive appropriate therapy while they are still at the clinic.
Point-of-care (POC) diagnostics offer great potential to detect and monitor infectious diseases
at resource-limited settings, because POC diagnostics can be taken to remote locations, decreasing the need for large decentralized diagnostics facilities. Desired characteristics of
POC diagnostic technologies include (i) disposability, (ii) cost-effectiveness, (iii) ease of use and (iv) portability [8]. POC diagnostics should be able to analyze small volumes of bodily fluids, e.g., blood, saliva and urine. Global health programs are significantly hindered because such tests are currently unavailable. There is also need for individual tests for emerging and re-emerging diseases such as tuberculosis,

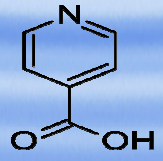
Main Data
- Paper based method for rapid detection of Tuberculosis.
- The microfluidic device contains a stack of three papers separated by a paper the stack of these paper are coated with
  - Barbituric acid:- is an organic compound based on a pyrimidine hetrocyclic skeleton. It is an odorless powder soluble in water.



  - Chloramine T:-Chloramine-T is slightly basic (pH typically 8.5). In water, it breaks down to the disinfectant hudrochlorite. Chloramine-T is available in tablet or powder form and has to be dissolved before use. It is sprayed on a surface and allowed to stand for at least 15 minutes before being wiped off or allowed to dry

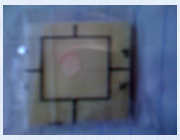


  - Potassium thiocyanate:- It is the chemical compound with the molecular formula KSCN.
  - isonicotinic acid:- Isonicotinic acid is an organic compound with a carboxyl group on a pyridine ring. It is an isomer of nocotonic acid — the carboxyl group for isonicotinic acid is on the 4-position instead of the 3-position for nicotinic acid.

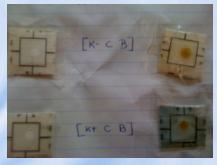


  - Inkjet Printed acrylic sheet:- A acrylic sheet is printed with a cube structure of 1"x1". A hole is then punched in these cubes of 0.5 cm.
  - Polyvenyl Alcohol :- Poly-vinyl alcohol (PVA) is a low temperature thermoplastic with the interesting property of being soluble in water. With a melting point below that of PLA and a texture and compression profile similar to ABS it is relatively easy to extrude. However, because of PVA's sensitivity to water, even mild humidity can ruin an unsealed spool of filament.

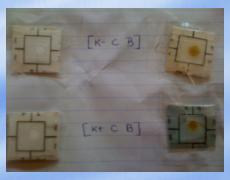
Experiments
Step 1 Preparation of the sample in with 10% concentration. The stack of the papers are coated three sample and kept to dry.
Step 2. Stack of paper coated with Barbituric acid (B), Chloramine T hydrate(C) and potassium thycyanate(K) is separated by micron paper. The top stack is then coated with 2% PVA
Step 3.The acrylic sheet of paper is then placed on the stack and packed using an scotch tape keeping the top hole empty. This fabricated device is then ready for testing.



Step 4 The and isonicotinic acid (1%) is passed through the hole in the fabricated device. Isonicotonic acid share the same structure as Tuberculosis metabolites. So when they enter the fabricated device they try pink and then reliving a blue color indicating presence of TB.
Step 5The result observed with stack of [BCK] where one K+ is coated with PVA and the results are as follows.



Step 6 When the stack is inverted [K C B] where B+ is coated with PVA and the results shows that paper turn blue faster than [B C K]



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