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Hosted by;

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1. Aim of this trip:

Initially, the goal for this visit was to visit and learn fluorescent biosensing using the enzyme N-acetyltransferase (NAT) coupled to the fluorescent probe 8-anilino-1-napthalene sulphonic acid for the detection of TB drugs. On my arrival here I was introduced to a more interesting topic(s) which ˆ ‘ — • † – ‘ „ ‡ ƒ Ž • ‘ ” ‡ Ž ‡ ˜ ƒ • – – ‘ – Š ‡ ” ‡ • ‡ ƒ ” … Š ™ ‘ ” • † ‘ ƒ – ‡ • • ‘ ” ƒ „ ä of TB bac– ‡ ” ‹ — • — • ‹ • ‰ • ƒ ‰ • ‡ – ‹ … • ƒ • ‘ ’ ƒ ” – ‹ … Ž ‡ • ï ƒ • † î ‘ Ž Ž ‘ ™ ‹ • ‰ – Š ‡ ‰ and E.coli bacterium using microfluidic • › • – ‡ • • ï ä — ” – Š ‡ ” † ‡ – ƒ ‹ Ž • ‘ ˆ – Š ‡ ” ‡ • ‡ ƒ ” … Š discussed below. Secondly, the goal of this trip was to also establish a long lasting collaboration between the above mentioned laboratory and SensorLab with particular emphasis on the TB research work done in both laboratories.

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2. The actual work done:

I had the privilege of learning house to design and develop microfluidic systems. This technique took a period of two weeks to complete and to ensure that they were suitable and stable for the desired experiments. I did not do the work which I initially intended to do but I was introduced to a very interesting subject which is the detection of Mycobacterium Tuberculosis using microfluidic systems connected to Precision Impedance analyzers for analyses through two electrodes. This subject was very interesting to me particularly because I had previously developed imunosensors for the detection of Tuberculosis antigens. I was also pleasantly 2(I)-3d-uies.eIde-6otd7A(iru01cyti)-2(on t)-5

2.1 The following experiments were achieved .

2.1.1 Experiment 1:

One comprised of the decontaminated bacterium alone and the growth of the bacterium was studied over 5 hours. For analysis, 20 µL of the bacterium was inserted into the cassette and the impedance reading was carried out. Five of the same sample was taken and the readings were take at each hour. The result was a directly proportional relationship between time and the growth of the bacterium.

The second experiment comprised of the decontaminated bacterium as well as the antibiotic ampicillin to study the killing of the bacterium over 5 hours. For analysis, 20 µL of the bacterium was inserted into the cassette and the impedance reading was carried out. Five of the same sample was taken and the readings were taken at each hour.

The result was the inverse relationship between time and the killing of the bacterium.

Due to the sensitivity of the work; these experiments were done several times to ensure stability and repeatability.

2.1.2 Implementation of this work at SensorLab.

The foundation of the research work at SensorLab is Electrochemistry therefore to replicate this type of work would require the presence of a conducting material whose electrochemistry would have to followed relative to the growth of death of the bacterium of interest.

In a conventional three electrode system immersed in pH 7.4 phosphate buffer, the bacterium

2.1.3 Experiment 2:

The second part of the work involved the detection of the bacteria Mycobacterium smegmatis using magnetic nanoparticles. The aim was to attach the bacteria onto modified magnetic nanoparticles in a fast way such that an infected patient can have their results in a shorter period of time as opposed to currently available methods of detecting these bacteria.

The first part of his study involved the preparation of sub-cultures from the mother culture of M. smegmatis to allow the bacteria to grow in the growth supplement Middlebrook OADC. This part was completed before I arrived. The bacterium was also decontaminated using 2 % NALC solution. UV spectroscopy was used to determine the amount of bacteria before subjection of the magnetic nanoparticles. The conventional plating method was also carried out in order to determine the exact number of bacteria present.

Artificial sputum was the created using 7H10 Agar base and Middlebrook OADC Both and one egg (MEDIA). Thereafter, the bacteria and the MEDIA were all added to the magnetic nanoparticles in a tube and mixing was allowed manually for 5 minutes. Magnets were then placed around the tube to separate the nanoparticles containing the bacteria from the rest of the solution. The supernatant