Laser Induced Breakdown Spectroscopy (LIBS) In Diagnosing Tuberculosis: A Proposed Tool

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Background

The global tuberculosis epidemic, killing 2 million and adding 9 million new cases a year, remains a major public health concern. Low sensitivity of sputum smear and long time taking process for mycobacterium culture to be interpretable make them non effective tools in the current scenario. Declining quality of the smear examination in overburdened laboratories in HIV-endemic countries like India makes acid-fast smears on sputum specimen as a relatively insensitive test for pulmonary tuberculosis in AIDS/ARC patients, which is another concern. None of the commercially available rapid tests are well enough to replace sputum smear microscopy, thus these tests have little or no role in the diagnosis of pulmonary tuberculosis. Therefore, development of rapid and accurate new diagnostic tools is imperative.

Aims & Objectives

To postulates a screening tool aimed to have a real time detection of tubercular bacilli using LIBS modality

Material & Methods

Generation of elemental line spectra by converting sample material in plasma plume through a laser pulse and its analysis through fiber spectrophotometer is the key. The whole process can be considered as minimally destructive and real time as nano- to micro-grams of material is ablated in femto-to nano-seconds (depending on the laser pulse duration). The postulated hypothesis is aimed to use laser induced breakdown spectroscopy (LIBS) in the detection of tubercular bacilli as trace mineral elements acts as biological signature in living and non living entities and store information regarding habitat, nutrition, and other environmental conditions.

Results & Conclusions

Previous researches have shown significant differences in trace element concentration in different bacterial strains. The technique is exemplified by suggested use of LIBS in studying biological samples such as tissues, gall stones, biological aerosols in vivo cancer detection and discrimination of E. coli strains.