

Spectroscopic Investigations of Surface Deposited Bacterial BW Simulants

Matthew J Baker^{1*}, Konrad Dorling¹ and Alastair McIntosh²

¹Centre for Materials Science, Division of Chemistry, School of Forensic and Investigative Sciences, University of Central Lancashire, Preston, PR1 2HE, UK

²Detection Department, Dstl Porton Down, Salisbury Wiltshire, SP4 0JQ, UK

*Corresponding author: mjbaker@uclan.ac.uk

Abstract

The defence against the use of biological weapons (BW) is becoming an increasingly important concern which is reflected in the National Security Strategies of the USA and UK. The UK has highlighted international terrorism affecting the UK or its interests, including a chemical biological, radiological or nuclear attack by terrorists as a tier one risk¹. The USA specifically mentions countering the biological threat to strengthen resilience across the spectrum of high-consequence biological threats².

Many BW agents will remain viable in the environment for a substantial period of time posing a continued risk, hence there is a requirement to facilitate hazard avoidance, control of the spread of the hazard, exposure management and decontamination confirmation.

This paper will discuss the use of spectroscopy combined with pattern recognition algorithms and its use for detecting surface deposited BW simulants. Spectroscopy is quick, cost-effective, simple to operate, reagent free and requires simple sample preparation. The bacterial strains analysed were selected to cover a range of bacterial groups representative of BW threat agents and common environmental bacteria (*Bacillus atrophaeus*, *Bacillus thuringiensis* var *kustaki*, *Bacillus thuringiensis* ATCC 29730, *Escherichia coli* MRE 162, *Pantaeoa agglomerans* ATCC 33243 and *Pseudomonas fluorescens* ATCC 13525). This proof of principle paper will also discuss the impact of environmental conditioning (a daily cycle of temperature and humidity for 30 days) of these simulants on the spectroscopic signatures and pattern recognition models. The temperature and humidity conditions are within the ranges prescribed in the Ministry of Defence Standard on Natural Environments and measurements from Camp Bastion, Afghanistan.

[1] A Strong Britain in an Age of Uncertainty: The National Security Strategy, CM7953, October 2010.

[2] National Security Strategy 2010, United States Government, May 2010.