Toward Understanding the Biological Threat Posed by Suicide Bombers

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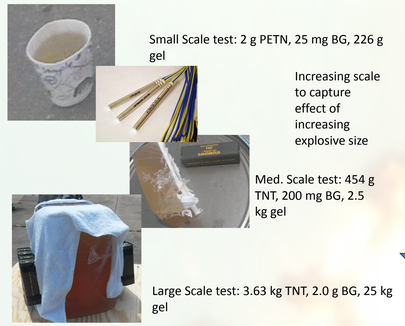
Abstract

In order to assess the biological threat posed by suicide bombers, we detonated HE with ballistic gelatin blocks using Bacillus atrophaeus (BG) spores as an organism simulant in increasing scaled size in three tests. The results of our test shows that 1) organisms can survive the blast, and 2) be widely dispersed in both aerosol and visible remains of the bomber. **Our results show that a suicide bomber carrying a highly infections disease poses a significant threat in excess of the damage from the bomb itself.** We detected living organisms in large pieces of gel as well as on collection tiles without ANY visible contamination. Significant aerosol concentrations of ballistic gelatin were detected by a UV-fluorescence based particle counter.

Introduction

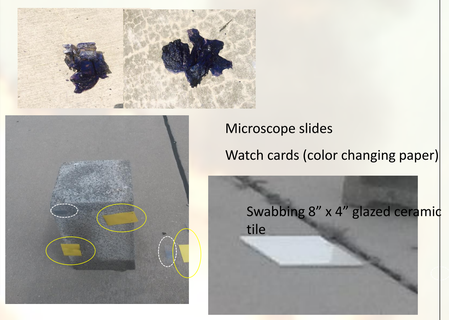
Pieces and particles formed from the remains of a suicide bomber are a potential biological threat. Studies performed in Israel in response to the 7/7/2005 London Underground bombings showed the potential for the transfer of infectious disease to survivors of an initial blast. Our objective is to assess 1) if organisms can survive the heat and pressure of the high explosive blast, 2) the minimum particle size that can harbor living organisms, and 3) how far the explosion can disperse particles containing living organisms. Our results are relevant to both the Army's mission as well as Homeland Security because it can help assess the severity of the infectious biological component of the suicide bomb threat.

Methods



Increasing scale of tests. A BG positive and a BG negative shot run at each size

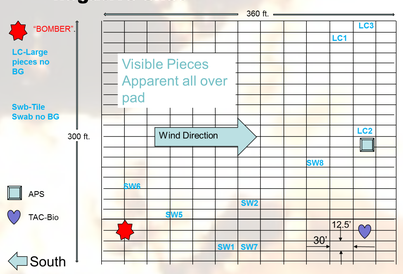
Sampling Methods



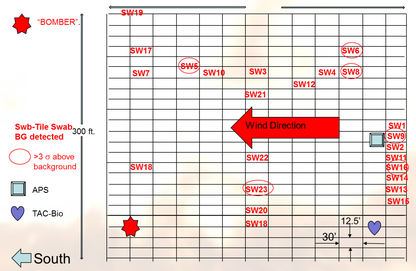
Results/Discussion

Stills of the large scale test with BG (8lbs. TNT, 59 lbs. gel, 2 g BG

Map of Large Scale Test Collection of Swabs and Large Pieces for BG negative shot

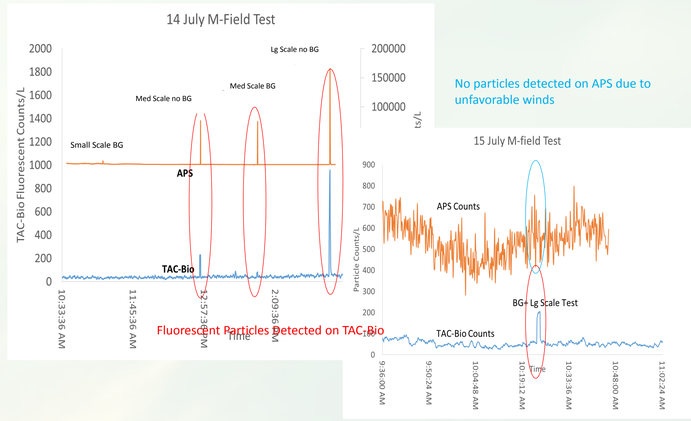


Swab collection map for large scale BG Positive shot



- Negligible measurements of bacteria for BG negative tests
- Non-negligible amounts bacteria detected on swabs up to ~350 ft away from blast.
- For the BG Positive test, no visible bits of gel were apparent showing living bacteria delivered in small, aerosol sized particles

Aerosol Counter Data
APS vs. TAC-Bio counts for Large Scale Test



The APS shows significant counts of total aerosols, including dirt, smoke, and other particles. Because TAC-Bio uses UV-fluorescence, it is sensitive to only aerosols from the gel. We detect significant concentrations of gel.

Conclusions

Within the limitations of using ballistic gelatin as a model of a suicide bomber, we demonstrated that even small, aerosol sized pieces of gel can protect organisms from the effect of the high explosives blast. We have proven that these small particles containing live organisms can be hurled hundreds of feet by the blast. We expect aerosolization from a real human containing blood, bone and other bodily fluids will aerosolize even more material. We intend to seek additional funding to continue finer grained tests that incorporate other organisms, such as MS2 virus, or vegetative E. coli, to assess how survivability changes based on the threat organism.

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Approved for Public Release

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