Efficacy of Sandia National Laboratories Decontamination Formulations Against Coronaviruses such as SARS

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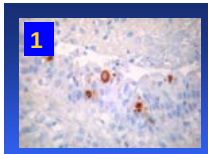
Abstract

Severe Acute Respiratory Syndrome (SARS) is caused by a coronavirus that remains infectious for extended periods in the environment. The objective of this research was to evaluate the efficacy of Sandia developed decontamination formulations at various concentrations against the SARS coronavirus. SARS virus has been recently classified under antigenic group II among the family *Coronaviridae*. Bovine coronavirus (BCV) was used as safe a surrogate of SARS virus for studying the viral inactivation. Quantitative inactivation was assessed using hemagglutinin activity (HA) with rodent erythrocytes. Loss of viral viability was verified using fluorescent antibody tests and electron microscopy. Inactivation was assessed after 1 or 3 min. of exposure to 50, 25, or 12.5% concentrations of the test formulations and in the presence or absence of organic material. Results indicate that BCV is completely inactivated after 1 min of exposure to 12.5% concentrations of the test formulations even in the presence of the various organic challenges (feces and compost).

Results & Discussion

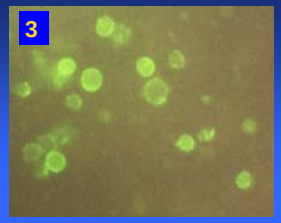
- **Complete inactivation of BCV after 1 minute of exposure with concentrations as low as 12.5% the recommended concentration and in the presence of organic material including feces and compost**
- **All experiments were conducted 3 x's**
- **All results verified by cell culture, HA, FA, and EM**

Materials and Methods

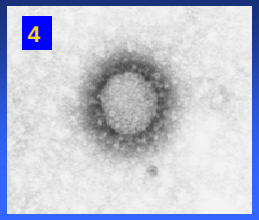


1. Coronavirus in infected lung

2. Hemagglutinin: addition of rodent erythrocytes to the sample for agglutination.

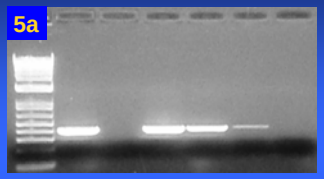


3. Fluorescent Antibody Test (FA): (+) results indicated by apple-green fluorescence in cytoplasm of infected cells

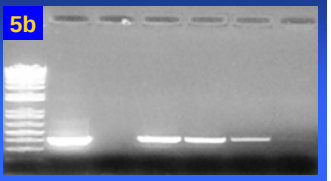


4. Electron Microscopy: used to visualize physical structural integrity of untreated BCV.

5. Preliminary PCR: Integrity of viral RNA (nucleocapsid region)



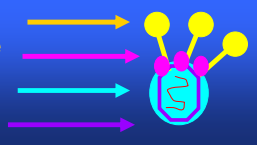
5a
Lane 1: DNA ladder
Lane 2: Positive sample of BCV
Lane 3: Negative sample of BCV
Lane 4: BCV + 0.1M PBS (TRT Cont)
Lane 5: BCV + 12.5% Sandia DF-200D
Lane 6: BCV + 25% Sandia DF-200D
Lane 7: BCV + 50% Sandia DF-200D



5b
Lane 1: DNA ladder
Lane 2: BCV + 0.1M PBS (TRT Cont)
Lane 3: 0.1M PBS + 45% Sandia DF200D (NEG Cont)
Lane 4: BCV + 30% Sandia DF-200D
Lane 5: BCV + 35% Sandia DF-200D
Lane 6: BCV + 40% Sandia DF-200D
Lane 7: BCV + 45% Sandia DF-200D

Conclusion

- **Sandia decontamination formulations are likely highly effective at completely inactivating SARS-like coronaviruses as demonstrated by inactivation of BCV**
- **Possible mechanism is disruption of the lipid envelope resulting in denature and/or destruction of important structural proteins/components**



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