Ground Truth Document – *Mucormycosis*

Pathogen Type: Mucormycosis is a serious fungal infection [sometimes called *black fungus syndrome*] caused by a group of molds called mucormycetes. The mucormycosis strain in this scenario is a fungal infection whose symptomology is serious and familiar but selective [the subject presents *only* one or two egregious symptoms]. About three hundred species of fungi are pathogenic to humans.

Origin & Emergence Details: Mucormycete organisms are everywhere in nature, particularly in soil, decaying wood, fruit and vegetables, and other organic matter, such as animal feces. One can contract mucormycosis as a result of an untreated burn or blunt or penetrating trauma or by breathing in affected mold spores in the air, referred to as a sinus (pulmonary) exposure.

Pathogen emergence in this scenario is partly the result of an EF5, long-track tornado in the Dixie Alley of the United States [eleven tornado-prone southern states]. As a result of global warming, stronger tornadoes are moving south and east into more economically depressed, high-density population areas [see Other Impacting Factors]. Coincidentally, woodsmoke from massive forest fires carries fungal spores that potentially enlarge both the number and area of the incidents [see, again, Other Impacting Factors]. Research projects are currently testing bioaerosols in the woodsmoke from forest fires [a discipline dubbed *pyro aerobiology*] to try and identify the microbial contents of smoke and to correlate infection records with maps of the directions in which smoke drifts during fire seasons. Mucormycosis is not contagious and it cannot spread from people and animals, but numbers increase dramatically in this *perfect storm* scenario of mass exposure.

Mucormycosis is diagnosed by looking at a tissue sample in the lab or a sample of fluid from the respiratory system or by using a CT scan of lungs, sinuses, or other parts of your body. The first steps in treating mucormycosis are intravenous (IV) antifungal medications and surgical debridement.

Pathogen characteristics: Mucormycosis, or “black fungus syndrome”, is a rare but dangerous infection that can cause infected tissue to die and turn black. Often starting in the sinuses, the infection may spread to neighbouring tissues and organs, including the eyes and brain, resulting in blackened skin, facial swelling, blurred or lost vision, altered consciousness or coma.

Impacting Factor - Climate: Because of global warming, human beings are more vulnerable to fungal pathogens as a result of violent weather events such as tornadoes and forest fires. This vulnerability increases dramatically as a result of injury or simply breathing air filled with woodsmoke. This woodsmoke often traverses national borders with its lethal cache of bacteria and fungi. For instance, the fungal pathogen, Valley Fever, was up more than sixfold in Arizona and California from 1998 to 2018, and this incident rate has been correlated with wildfire smoke.

Impacting Factors - Economic & Social Issues: The poor constitute the most vulnerable demographic for fungal pathogens. At the onset of a violent storm that might cause injury, they are less likely to have basements in their domiciles or access to safe shelters. Similarly, in the afterward of fungal infection, they are less likely to have the means to afford hospital tests and treatment. Also, there is a correlation between poverty and those with compromised immune systems and these individuals are typically [but not always] more vulnerable to fungal infections. And this remains true, of course, in the event of pathogenic fungal infection through exposure to forest fire smoke. Conversely, fungal pathogens in woodsmoke will affect all economic strata. We all need to breathe. This last point, [coincidentally sad and promising], means that the political will for study and treatment will be much greater than had the disease affected only the poor.