ANTHRAX - BIOLOGICAL THREAT IN THE 21ST CENTURY

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The causative agent of the anthrax, spore-forming bacterial rod Bacillus anthracis was discovered by Robert Koch in the nineteenth century. The B. anthracis spores are highly resistant to inactivation and may be present in the soil, for decades and occasionally infecting grazing animals that ingest the spores. Hundred of years ago, anthrax was significant mainly as an economically damaging disease of domesticated animals. Once common where livestock was raised, it is now controlled through animal vaccination programs. Anthrax still occurs in countries where animals are not vaccinated, mainly in Africa and Asia. It does infrequently occur in many countries, including the United States.

Human anthrax is a disease acquired following contact with infected animals. Anthrax is not contagious; the illness cannot be transmitted from person to person. Cutaneous anthrax is the most common naturally occurring type of infection (>95%) usually occurs after skin contact with contaminated meat, wool, hides, or leather from infected animals. Gastrointestinal anthrax usually follows the consumption of raw or undercooked contaminated meat. Inhalation anthrax is the most serious and rare form of human anthrax. Breathing in airborne spores may lead to inhalation anthrax.

The bacteria secretes a toxin made up of three proteins: capsular antigen, odema factor and lethal factor. However the manifestation of anthrax infection are not solely due to the effects of the toxins as is the case with diphtheria, tetanus or botulism. Results of other work in mice imply that further non-toxin components contribute to virulence that have yet to be identified. The mortality rate for anthrax varies, depending on exposure, and are approximately 20% for cutaneous anthrax without antibiotics and 25-75% for gastrointestinal anthrax; inhalation anthrax has a fatality rate that is 80% or higher. The only known effective prevention against anthrax is the anthrax vaccine. Antibiotics constitute the mainstay of treatment, although anti-toxins have long been considered an essential ‘adjunctive’ therapy, and remain so.

The odds that any one individual in the United States will contract anthrax is extremely low, one in about 300 million. The tragic events in the United States on 11 September 2001 and with the intentional release of Bacillus anthracis spores in some environments, has spurred a chilling HIV-like fear and anxiety throughout the world. Who could have imagined people getting anthrax from handling ‘animal’ mail?

Anthrax is a potential biological terrorism threat because the spores are resistant to destruction and can be easily spread by release in the air. Anthrax as a bioweapon is a science fiction in the past. A second look at the reality shows that biological weapon poses by far the greatest threat, because they can be as lethal as nuclear weapons. Anthrax is the biological weapon most likely to be encountered because it is easy to produce in large quantities, highly lethal, relatively easy to develop as a weapon, easily spread over a large area and easily stored and dangerous for a long time. Aerosol exposure to anthrax spores could cause symptoms as soon as 2 days after exposure. However, illness could also develops as late as 6-8 weeks after exposure. Further, early presentation of anthrax disease would resemble a fever or cough and would be exceedingly difficult to diagnose with a high degree of suspicion. Once symptoms begin, death follows 1-3 days later for most people. If appropriate antibiotics are not
Biomedical scientists should consider biological weapons as a serious ‘emerging new pathogens’ to be controlled and prevented for the good of humanity. New revolution in biology could be misused in offensive biological programs directed against human beings and their staple crops or livestock. Any misuse of biology is prohibited by the 1975 Biological and Toxin Weapons Convention (BTWC). Article 1 of the Convention states:

“Each State Party to this convention undertakes never in any circumstances to develop, produce, stockpile or otherwise acquire or retain:

1. Microbiological or other biological agents, or toxins whatever their origin or method of production, of types or in quantities that have no justification for prophylactic, protective or other peaceful purposes.”

Let us hope this so called General Purpose Criterion is respected by the over 140 States Party in the Convention for the good of all human kind.

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References