Acinetobacter Baumannii

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Abstract

Acinetobacter baumannii is one of many new emerging infectious diseases that have become a challenge for the health care community. It is increasingly problematic due to the indiscriminate nature of the bacterium and ability to live and grow for long periods of time on multiple surfaces. A descriptive summary including transmission, clinical presentation and diagnosis will be provided; additionally, current research and outbreak guidelines will be reviewed. As researchers learn more about Acinetobacter baumannii and other multidrug-resistant bacteria, the healthcare system must remain vigilant and prepare for potential outbreaks. Standard precautions, especially good hand hygiene, are the key components to stopping transmission of this and other bacterium from spreading.

*Keywords*: acinetobacter, infectious disease, multidrug-resistant
Acinetobacter Baumannii

In the late 1960s, it was thought that the number of infectious diseases was diminishing, and chronic diseases were more prevalent. This was truly a time for celebration as many diseases, such as smallpox, would eventually become merely health care concerns that were read about in textbooks and through medical archives. Unfortunately, this is not the case anymore. There are over fifty diseases that are classified by the Centers for Disease Control (CDC) as emerging infectious diseases (EID). While this number may appear to be small, the number of individuals that are affected by these diseases range in the millions and is the leading cause of death for people under the age of fifty worldwide (Veenema, 2007, p. 438).

Many factors play into which members of the population will become ill and which will remain unaffected. The chain of transmission must be present; the agent, reservoir, portal of exit, mode of transmission, portal of entry, and finally a susceptible host. Additional factors to consider would include the climate. This can become a concern with extreme temperatures, and changing climates. The environment that we live in is constantly evolving through land development, farming, and urbanization. “Approximately 75% of emerging pathogens are zoonotic, or communicated by animals to humans” (Veenema, 2007, p. 438). High risk behaviors, geographical location and travel are additional concerns as we evaluate the increasing concerns for EID.

Descriptive Summary

Transmission

Acinetobacter baumannii is an opportunistic, aerobic gram negative coccobacillary rod that lives in soil and water. It has the capability to grow in a broad variety of temperatures and pH levels. It is highly resistant to medications, and has the ability to affect all individuals
regardless of age, sex, or race (CDC, 2010, p. 1; Cunha, 2011, p. 2). These conditions along with the ability to survive for up to five months on dry and moist surfaces make this an EID that needs to be researched and understood by all levels of the health care system (CDC, 2010, p. 1).

Direct contact from person to person, indirect contact from person to intimate objects and surfaces are routes of transmission of Acinetobacter baumannii. As with most infections, those members of the population with a weakened immune system, chronic respiratory conditions, and the elderly will be more susceptible to developing acinetobacter baumannii than those that are healthy (CDC, 2010, p. 1; Karageorgopoulos & Falagas, 2008, p. 751).

**Clinical Presentation/Diagnosis**

Acinetobacter baumannii is one of many species of acinetobacter; while all species can cause human disease, “baumannii accounts for about 80% of reported infections” (CDC, 2010, p. 1). With the wide variety of infections, the clinical presentation will vary from person to person depending on the disease. Respiratory conditions are the most common clinical presentation as many patients develop pneumonia, tracheobronchitis, and community–acquired bronchiolitis.

Additional syndromes reported include “bacteremia, along with surgical site infection, skin and soft tissue infection, and urinary tract infection” (Karageorgopoulos & Falagas, 2008, p. 751). As with any infection the symptoms could include fever, cough, chest pain, redness or swelling around wounds or surgical sites, burning urination, headache, stiff neck, and elevated white blood cell counts.

Patients are often diagnosed through wound, respiratory and urine cultures. Multiple sources including intravenous (IV) lines, surgical drains, ventilators, tracheotomies, and urinary catheters are sources of the infection. Physicians may ask for x-rays if they are suspecting pneumonia or other infections. If meningitis, an infection around the brain and spinal cord, is

**Therapy**

The gram negative coccobacillary rods are capable of producing a biofilm which protects the rods. This film prevents the antibiotics from entering the cell and breaking it down, therefore making Acinetobacter baumannii multidrug-resistant and difficult to treat (Loehfelm et al., 2008, p. 1037). In the past, medications that have been considered helpful treating infections are now becoming ineffective. Researchers are unclear why this happens, although the general consensus is that failure is associated with “reduced adherence to drug therapy, suboptimal dosing, diagnostic and laboratory error, ineffective infection control, counterfeit or altered drugs, and resistance” (MacPherson et al., 2009, p. 1727).

Finding the correct treatment plan for each case can prove to be a challenge for physicians. Acinetobacter baumannii is multidrug-resistant in approximately 30% of all cases according to recent trials (Karageorgopoulos & Falagas, 2008, p. 751). Therefore, it is important that a culture is obtained from the suspected source prior to any treatment. While the culture is growing in the laboratory, a broad spectrum antibiotic will be initiated until the sensitivity report is completed. The gold standard in treatment consists of carabapenems such as imipenem and meropenem. If patients are unable to use these medications or if the strain of Acinetobacter baumannii is resistant to these medications then often tigecycline and colistimethate are used as alternatives (Montefour et al., 2008, p. 19).
Analysis

John Snow provided the first research study regarding outbreaks of diseases when he mapped out the number and location of cholera cases in London. Since that time, researchers have used a combination of science and surveillance to study bacteria growth and treatment therapies. Acinetobacter baumannii infections most commonly occur in the critical care settings; although it has been associated with outbreaks in other areas of the hospital (Weber et al., 2010, p. 531). Three factors influence the role of Acinetobacter baumannii in the hospital. First, the diverse reservoir makes conditions in the ICU a virtual breeding ground for bacterium. Secondly, Acinetobacter baumannii is extremely antimicrobial resistant making it difficult to control and destroy; and finally, the elevated potential for an outbreak. The multitude of possible sources of infection requires healthcare workers to remain vigilant in standard precautions to prevent the spread of the bacterium (Montefour et al., 2008, p. 16).

Acinetobacter baumannii research is currently focusing on what role, if any, does the biofilm play in the difficulty of treating patients with this infection. The biofilm appears to be a high-molecular-weight protein. While research indicates that these proteins have the similar structure and function, they may not contain identical sequencing. The Antimicrobial Availability Task Force of the Infectious Disease Society of America recently identified Acinetobacter baumannii as a “particular problematic pathogen for which there is a desperate need for new drug development” (Loehfelm, 2008, p. 1048).

International movement of people and products continue to add to the problem of public health. “Expanding human population mobility will affect and influence the spread, introduction, and endemicity of resistant and untreatable microbes because infections are
unequally and rather unpredictability distributed around the world” (MacPherson et al., 2009, p. 1728; Veenema, 2007, p.439).

Currently, no clear cut answer is available. No one knows what new diseases will emerge or which old ones will reappear. As health care workers, the goal is to prevent outbreaks of Acinetobacter baumannii by recognizing potential cases and reporting them immediately. All patients should be screened for this infection as they are admitted to the ICU (Karageorgopoulos & Falagas, 2008, p. 753). Through research the risk factors have been identified, however, the “pathogen is poorly understood” (Montefour et al., 2008, p. 16). If in doubt, the patient should be considered positive, standard precautions maintained, until cultures are cleared by the laboratory and the physician. As research continues into the treatment options, the gold standard of care involves active education, training, and surveillance for the disease.

**Promotion of Disease**

**Outbreak Potential**

The goal of health care workers is to control the hospital environment and decrease the risk for spread of the infection to other individuals. “Health care-associated infections (HAI) remain a major cause of patient morbidity and mortality in the United States, it is estimated that there are 1.7 million HAI each year, which result in approximately 99,000 deaths” (Weber, Rutala, Miller, Husiage & Stricker-Bennett, 2010, p. 525). All areas of the hospital are sensitive to acinetobacter baumannii infections however, the intensive care units (ICU) are where a majority are detected. Many patients in the ICU have chronic underlying conditions that enhance their susceptibility to these infections. This same population of patients has multiple IV lines, surgical drains, catheters (IV, urinary, and central venous), and ventilators while in the ICU. Acinetobacter baumannii are an opportunistic infection just looking for a way to enter the
patient; therefore each of these provides the perfect entry point and the perfect environment (CDC, 2010, p. 2; Montefour et al., 2008, p. 15).

Acinetobacter baumannii is extremely dangerous. Studies have shown the bacterium has the ability to live on surfaces for up to five months. Colonization on patients or reusable equipment can easily cause an outbreak in the ICU and potentially throughout the entire hospital (Karageorgopoulos & Falagas, 2008, p. 752; Montefour et al., 2008, p. 18).

Potential sources for colonization include supplies and equipment used in the room such as carts, masks, scales, multi dose vials of medication, shared equipment, suctioning devices, and computers. The room itself hosts many opportunities for growth on the bed rails, door handles, stands, IV poles, sinks, table tops and even the sharps container. Pillows, curtains, linens, mops, brooms and waste baskets are also environmental sources. One study even identified dust as a potential source (Montefour et al., 2008, p. 17).

**Outbreak Recommendations**

During an outbreak, patients should be isolated or cohorted into one unit within the hospital. This unit should then be off limits to other patients to minimize the risk for acquiring the disease. Staff members and equipment should be dedicated for treatment of this population. By providing dedicated staff, it will assist in controlling the outbreak as these team members take ownership in providing the best care possible and eliminating the infection (Montefour et al., 2008, p. 17).

Education and communication is the key to successful interventions. Newsletters and bulletins can be developed to keep staff current with treatment plans, infection prevention goals, and to address concerns by team members. This form of communication provides written
documentation that “avoids the pitfalls of misinterpretation of answers and missed instructions, giving all staff the benefit of others’ questions (Montefour et al., 2008, p.17).

Staff members may begin to feel isolated from the rest of the hospital. Unfortunately, there will be negative stigma associated to the ICU and staff members that work there (Montefour et al., 2008, p.24). It is advised that emotional support is provided to this group of dedicated workers as they care for these critically ill patients and worry about their own health status.

**Disinfection**

Standard precautions should be maintained when working with patients with Acinetobacter baumannii. Weber and associates (2010) conducted a study to determine the length of time that Acinetobacter baumannii would last on the fingertips of health care providers; amazingly the results revealed that this bacterium was capable of surviving sixty minutes (p. 531). An hour may not seem relevant to some, yet a thorough analysis of the multiple tasks accomplished during this time frame will reveal the thousands of surfaces that are touched. Each surface then becomes a potential breeding ground for Acinetobacter baumannii. The best way to stop the spread of this or any other infection is to wash hands before and after contact with every patient (CDC, 2010, p. 1; Karageorgopoulos & Falagas, 2008, p.753; Montefour et al., 2008, p. 531). The behavior of health care workers to understand their role in disease transmission is essential. It is not acceptable to disregard the basic precaution to keep patients and yourself healthy.

Hospitals will have cleaning guidelines and procedures that must be followed during an outbreak. It is imperative these are followed and all staff members are educated regarding the serious nature of this disease. “Appropriate use of solutions containing ethanol is particularly
important because of applied at very low concentrations, this agent may induce alterations of Acinetobacter baumannii organisms to a more pathogenic phenotype with increased survival” (Karageorgopoulos & Falagas, 2008, p. 753).

**Summary**

Acinetobacter baumanii is one of the newest emerging infectious diseases. Many factors come into play in regards to which members of the population will be susceptible to the development of this disease. As patients’ age and health deteriorates we will see an increase in the number of patients who will visit the ICU each year. The responsibility of a health care provider is to keep them safe and free of exposure to pathogens such as Acinetobacter baumannii. While it is not possible to eradicate this bacterium it is essential that the transmission is decreased.

Through education and training, staff members will develop a sense of understanding and urgency why policies and procedures must be followed. Initial prevention and outbreaks are the responsibility of all interdisciplinary members. By working together, team members will avoid a widespread outbreak of the disease.
References


