

**NOSOCOMIAL  
IMPACTS GENERATED  
BY *Acinetobacter  
baumannii*: LITERATURE  
REVIEW**

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## INTRODUCTION

The incidence of *Acinetobacter baumannii* in the hospital sphere is a worldwide concern, since it is a multiresistant bacterium that represents an impasse in the health area due to the lack of sufficient antibiotics to attenuate it, in addition to making nosocomial treatment difficult. *A. baumannii* was the first bacterium, along with *Pseudomonas aeruginosa*, responsible for intra-hospital infections. In the context of Latin America, it has an incidence of 50% in Brazil and Argentina, which leads to an endemic characterization of the pathology. In addition, this bacterium fits the acronym “ESKAPE” referring to the main pathogenic and multiresistant bacteria, namely: *Enterococcus faecium*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa* and *Enterobacter spp.*

The *Acinetobacter baumannii* is a gram-negative bacterium, of high pathogenicity and virulence, aerobic, non-fermentative, frequent in humans and decomposing in soils. Its form can vary between cocci, in its stationary phase, and bacilli, in its active period. The *Acinetobacter baumannii* it causes more frequent opportunistic infections in moist tissues, such as the mucous membranes, the skin and the respiratory and urinary tract, which are installed in immunosuppressed organisms after surgery or in diseases undergoing hospital treatment. The main aspect of infected tissue is the “orange peel” appearance (Figure 1).



FIGURE 1: Erythematous nodular lesions



FIGURE 2: Nodular lesion with erythematous-violaceous infiltrated appearance with edema in the right ankle

Resistance, characteristic of these bacteria, is mainly due to the transmission of genes that reduce the amount and size of porins on the membrane surface of these bacteria, resulting in a higher survival rate in environments with the presence of antibiotics. It is resistant to carbapenem antibiotics [2], which are beta-lactams and its main drug to combat gram-negative bacteria is Imipenem, with a half-life of 1 hour. Meropenem and Doripenem in some cases can replace imipenem in spectrum of activity and pharmacology. Therefore, for a promising result in treatments

in which the patient already has a positive result for some type of bacteria, the ideal is to perform an antibiotic sensitivity test to avoid prescriptions that are not compatible with the pathogen's virulence factor. In addition, it is worth mentioning that the use of these drugs is exclusive to the hospital environment, due to the fact that the bacterium manifests itself in this environment due to the high number of immunosuppressed individuals and also in order to limit access by the general population, thus avoiding , the selection of even more resistant bacteria.

The transmission of this bacterium, with high relevance in Public Health, occurs through contaminated surfaces of wards and Intensive Care Units (ICUs) from patient to patient or even by equipment and health professionals responsible for the patient, which brings immense difficulty of control, since it becomes necessary to sterilize environments and raise awareness of people who will have contact with the bedridden person. Based on this obstacle, aerosols and antimicrobials were developed with the aim of reducing the density of bacterial colonies by measuring space, but their effectiveness depends on correct handling, in addition to not guaranteeing 100% response.

In the last 10 years, bacteria have been acquiring more and more resistance to the antibiotics used in the medical environment, culminating in a crisis of treatment effectiveness. Certain types of bacteria already show almost complete resistance to all types of antimicrobials available on the market, a fact largely due to the indiscriminate use of these drugs, contributing to genetic mutation and its transmission between individuals. XXX Add a sentence (without the table) about the 12 bacteria selected by the WHO.

Thus, the relevance of this study on multidrug-resistant bacteria, mainly *Acinetobacter baumannii*, is evident, due to

its high incidence in hospital environments, as well as measures to reduce its transmission and alternative treatments to the problem faced with antibiotics.

## **OBJECTIVE**

Know the problem of *Acinetobacter baumannii* involving the prevention and treatment of nosocomial infections and understand its transmission in the hospital environment.

## **METHOD**

The review was carried out in the PubMed database, based on articles published in the last 10 years. It was searched with the keywords: “*Acinetobacter baumannii*” AND “Cross Infection” AND “(Drug resistant, Multiple)” AND “Impact”. In all, 44 articles were pre-selected.

The selection criterion was carried out according to the keywords, language (Portuguese, English and Spanish) and date of publication of the article, but some works had to be discarded for escaping the proposed objective.

The first selection criterion was related to the title of the article: those that did not correlate with the keywords and with the objective proposed by the group were previously discarded.

The second selection criterion was after the complete reading of the articles: those that did not have affinity with the objective or deviated from the theme were excluded. In addition, some of the previously selected articles presented their full text blocked from the public, being automatically discarded. Thus, in the end, 21 articles remained that were analyzed and used as a basis for the preparation of this review.

## **RESULT**

From the study and reading of selected

articles, it was found that the infection caused by *Acinetobacter baumannii* burdens the health system[2,8,9]. It is estimated that in Europe an average of R\$ 1,286 to 25,862 is spent more by patients with a positive diagnosis for the bacterium, given the increase in hospitalization time and expenses with the treatment of the patient who has already undergone some intervention.[ 19] In view of this, prophylactic measures are the best options in terms of service disruption and cost-effectiveness.

Studies point to the importance of hygiene procedures by health professionals, such as hand hygiene as recommended by the National Health Foundation - FUNASA (Figure 2), being extremely effective in reducing transmission, compared to the built-in cost of this process and the decrease of patients colonized by the bacteria, after increasing hand hygiene.



Figure 2- Hand hygiene procedure according to FUNASA

In addition, it is of fundamental importance to emphasize that the exacerbated exposure to antibiotics causes a selection of the most resistant bacteria that communicate with

other bacteria through the pili, transmitting resistance and reproducing strong organisms. WHO released a list (Table 1).

<p><b>Critical Priority</b>  <i>Acinetobacter baumannii</i>  <i>Pseudomonas aeruginosa</i>  Enterobacteriaceae</p> <p><b>high priority</b>  <i>Enterococcus faecium</i>  <i>Staphylococcus aureus</i>  <i>Helicobacter pylori</i>  <i>Campylobacter spp.</i>  <i>Salmonellae</i></p> <p><b>medium priority</b>  <i>Neisseria gonorrhoeae</i>  <i>Streptococcus pneumoniae</i>  <i>Haemophilus influenzae</i>  <i>Shigella spp.</i></p>
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Table 1- List of resistant bacteria according to WHO

The medical-hospital environment is one of the main means of contamination and transmission, and attention to disinfection and sterilization is essential in day-to-day work activities. According to the Brazilian Company of Hospital Services (EMSERH), in order to achieve complete hospital hygiene, this process must occur in three phases, in the following order: first, all dirt must be removed from any surface or environment, using water, detergent and manual mechanical action (cleaning phase). Subsequently, the destruction of pathogenic microorganisms in the vegetative form existing in articles or surfaces is carried out, through the application of germicidal solutions on a previously cleaned surface (disinfection phase). Finally, it is necessary to remove organic materials from a surface, with the aid of a disinfectant solution, applied directly to the contaminating agent (decontamination phase).[4]

Thus, there is the development of tests with bactericidal aerosol composed of phages, natural parasites of individuals of the Monera kingdom. Specifically for *Acinetobacter*, the  $\phi$ AB2 phage exhibited rapid adsorption (99% adsorbed in 8 min), a short latency period (10 min) and the ability to infect a broad spectrum of *A. baumannii* strains and cause complete lysis. However, by using the specific

phage for CRABS, which decreases their numbers, other bacteria were able to develop. As good results, there was also a decrease in the use of antimicrobials (Meropenem and Imipenem) since the phages clean what only chlorine would not be functional. and that *Acinetobacter baumannii* resistance to the phage has not been found.[4]

Still on the subject, the above authors and collaborators found a decrease in the number of multidrug-resistant bacteria as the dosage of the antibiotic was reduced, also emphasizing the importance of the antibiogram.[3] In another way, it was up to evaluate that probiotics with the intention of improving the intestinal rhythm and softening the bactericidal action did not obtain the desired success.

The method that presented the best results was the total isolation of the patient diagnosed as positive for *Acinetobacter baumannii*, staying in a ward or bed separate from other patients and with restricted contact with health professionals who should use Personal Protective Equipment (PPE) for standard protection, i.e. maximum. [3] However, this intervention comes up against the high cost of maintaining the proposed scheme and the difficulty of diverting the hospital routine to an exclusive and restricted case, which could be evolved into an epidemic case.

## CONCLUSION

It is concluded that to solve the problem surrounding nosocomial infections by *Acinetobacter baumannii*, prophylactic measures, such as hygiene procedures, are extremely effective in reducing transmission and are more cost-effective. In addition, it was analyzed that exacerbated exposure to antibiotics causes a selection of the most resistant bacteria, with the hospital environment being one of the main means of transmission. As a treatment for nosocomial



infections, the total isolation of the patient diagnosed as positive for *Acinetobacter baumannii*, the use of Personal Protective Equipment (PPE) for standard protection and, above all, the correct administration of antimicrobials to the sick are fundamental. The burden of this intervention is the high cost for the hospital, which makes prevention the main measure to be taken.

It is concluded that exacerbated exposure to antibiotics causes a selection of the most resistant bacteria, with the hospital environment being one of the main means of transmission. To solve this problem, it is essential to pay attention to disinfection and

sterilization on a daily basis in work activities, as well as prophylactic measures, such as hygiene procedures to reduce transmission and provide better cost-effectiveness.[4] As a treatment for nosocomial infections, the total isolation of the patient with a positive diagnosis for *Acinetobacter baumannii*, the adequate use of Personal Protective Equipment (PPE) and, mainly, the correct administration of antimicrobials to the sick are fundamental. The burden of this intervention after the diagnosis of infection is the high cost for the hospital, which makes disease prevention the main measure to be taken.

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