

## **NBelyax nanoparticle test as a disinfectant agent, applied in the hands of nursing staff. Hospital de la Beneficencia Española and Hospital Nicolás San Juan, as case studies**

LEON-GUTIERREZ, Gabriela†, ALBARRAN, León, LEON-GUTIERREZ, Sergio and ARTEAGA-LOPEZ, Paola\*

Received July 25, 2017; Accepted December 16, 2017

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### **Abstract**

This study identified the presence of pathogenic microorganisms on inert surfaces of different areas intended for direct medical care in two hospitals of the national public sector located in different places of Mexico. In these hospitals the effectiveness of the nanoparticle NBelyax as a soap and hand soft cream broad spectrum disinfectant agent was determined using the microbial process through the evaluation of the percentage reduction of Colony Forming Units (UFC). Obtaining results of 100% effectiveness for pathogenic microorganisms.

**Nanoparticle, Nbelyax, Bacterial Challenge, Hospital, Hand, Handwashing, Nurses**

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**Citation:** LEON-GUTIERREZ, Gabriela, ALBARRAN, León, LEON-GUTIERREZ, Sergio and ARTEAGA-LOPEZ, Paola. NBelyax nanoparticle test as a disinfectant agent, applied in the hands of nursing staff. Hospital de la Beneficencia Española and Hospital Nicolás San Juan, as case studies. ECORFAN Journal-Republic of Guatemala. 2017, 3-5: 16-20.

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\*Correspondence to Author (email: parteaga\_lopez@hotmail.com)

†Researcher contributing first author.

## 1. Introduction

Since the mid-nineteenth century, chemical products applied to the skin have been used in order to prevent infections. Semmelweis (1847) introduces the practice of washing hands with chlorinated compounds. Lister, years later; expanded the use of phenolic solutions, both in the hands and skin of patients and in the instruments used. (1-6)

At present, even when the use of antibiotics in clinical practice is very broad, the use of antiseptics has not been eliminated as a measure to prevent infections; On the contrary, the formulations of old substances such as Iodine have been perfected and other more elaborate formulations have appeared. (7-9). However last year, the Food and Drug Administration (FDA) of the United States, released a statement on a new regulation of the use of antiseptics. The rule, published in the Federal Register of the United States, "Safety and Effectiveness of Consumer Antiseptics; Topical Antimicrobial Drug Products for Over the Counter Human Use" ([https://www.gpo.gov/fdsys/pkg/FR\\_2016-09-06/pdf/2016-21337.pdf](https://www.gpo.gov/fdsys/pkg/FR_2016-09-06/pdf/2016-21337.pdf)) (10) establishes the prohibition of the use of antiseptic products, based on the recommendations of the Supervisory Committee of Drugs Without Prescription (NDAC, by its acronym in English).

The previous provision is based on the results obtained when evaluating the effectiveness of antibacterial products for washing, compared with the effectiveness of non-antibacterial products; the results showed that there are no significant differences in the effectiveness of both. However, when the effects of the ingredients of these products were evaluated it was found that they had a high risk of producing reproductive alterations and cancer. In addition to causing bacterial resistance.

The studies carried out were in vitro to evaluate the bacterial resistance and in vivo to evaluate the toxicity as endocrine and carcinogenic disruptors. The in vivo studies were of the topical or dermal type and the pharmacokinetics, dermal absorption, dermal carcinogenesis, reproductive and developmental toxicity, as well as the hormonal effects were evaluated.

In total there were 19 ingredients that presented these effects. The foregoing demonstrates the need for the use of new technologies to cover this field that remains deserted, NBelyax is a good alternative since it does not need the prohibited ingredients to be effective against pathogens. As always, NBelyax is at the forefront since it has been tested in dermal toxicity studies and does not present alterations, as well as its main asset in studies of chronic and subchronic toxicity and it does not present adverse effects when administered. At the moment more sophisticated studies are being developed to evaluate the reproductive and carcinogenic effects of our product.

### 1.1 Justification

There is documentary evidence of the importance of guaranteeing an inhospitable environment free of germs, pathogens or with maximum permissible levels (NMP) according to current regulations, so it is currently recommended to conduct environmental sampling to identify the existence of pathogenic microorganisms, before out-of-hospital outbreaks or in case of trying to incorporate new techniques or innovative products developed with Nanotechnology.

The case before us is to determine the antimicrobial effectiveness of the products: soap and surgical antiseptic cream for its possible incorporation in the process of asepsis, sanitization and disinfection of the hands of the nursing staff of both hospitals.

## 1.2 Problem

Maintain safety and hygiene within the framework of the effectiveness of proper handwashing processes using nanotechnological innovation products that reduce the risk of intrahospital infections caused by the contact of infected material and the hands of nurses.

## 1.3 Objectives

### 1.4.1 General objectives

Identify the presence and control of pathogenic microorganisms in the hands of nurses at random.

### 1.4.2 Specific objectives

- Training and supervision of the proper hand washing process.
- Determine the quantitative value of germs before and after the application of surgical soap and antiseptic cream with the NBelyax nanoparticle.
- Determine the antimicrobial activity of the products with the NBelyax nanoparticle in hands, by applying the microbiology method.
- To determine the correct performance of the safety and hygiene processes as well as the effectiveness of products with the NBelyax nanoparticle.

## 2. Materials and methods

The process of applying soap and cream to the nursing staff was as follows:

### Soap with NBelyax nanoparticle

1. Prior taking of the sample with isopos in the hands of the nursing staff.
2. Hand washing with the soap, which contains the NBelyax nanoparticle, with a duration of approximately 20 seconds.

3. Rinsing process and taking the second sample after washing.

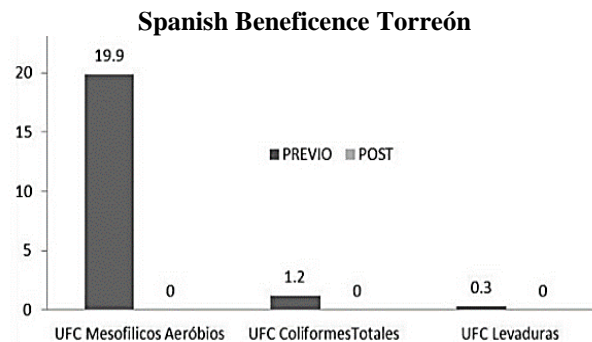
### Cream with NBelyax nanoparticle

1. Prior taking of the sample with isopos in the hands of the nursing staff.
2. Application of the cream in hands containing the NBelyax nanoparticle, allowing it to be absorbed into the skin for approximately 20 to 40 seconds.
3. Process of taking the second sample after washing.

Evaluation by means of microbiological techniques and obtaining results.

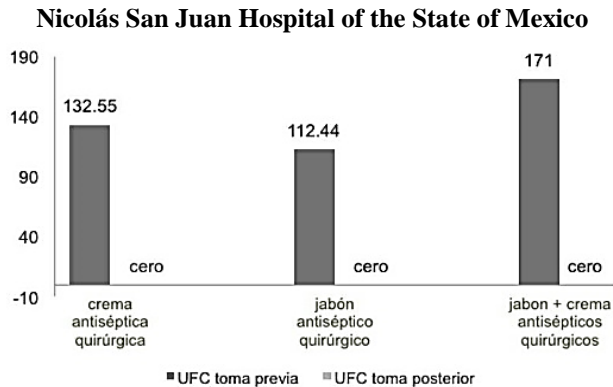
## 3. Results

### Hospital of the Spanish Beneficence of Torreón



**Graph 1**

Graph 1 shows the results of the effect of the use of surgical grade soap and antiseptic cream in hands. The results show the differences between the before and after use of both products on the final UFC count of mesophilic organisms, coliforms and yeasts present in the hands of the nursing staff of the Hospital de la Beneficencia Española in Torreón. It was observed that a decrease to zero of CFU is obtained after the application of both products.



**Graph 2**

Graph 2 shows the results of the effect of the soap and surgical grade antiseptic cream in hands on mesophilic organisms. The results show the differences between the before and after use of both products on the final UFC count of mesophilic organisms, coliforms and yeasts present in the hands of the nursing staff of the Nicolás San Juan Hospital in the State of Mexico. It was observed that a decrease to zero of CFU is obtained after the application of both products.

#### 4. Discussion and Conclusions

The results obtained in this study, give evidence of the bactericidal effect of the NBelyax nanoparticle in its modality as soap and cream development. The results of the sampling in two hospitals, evidence the reduction of CFU of mesophilic bacteria, coliforms and yeast present in the hands of the nursing staff of both hospitals. The results support the bactericidal effectiveness of the NBelyax nanoparticle.

It is concluded that the study objectives were fulfilled and the bactericidal effect of the NBelyax nanoparticle is based on the results of the microbiological study carried out. The study invites to develop later ones to broaden the microbiological spectrum of action.

New techno-scientific evidence was obtained as novel disinfection tools that can replace those products banned by the FDA. It is important to highlight the usefulness of reducing the presence of pathogenic organisms during the hand-washing process of medical personnel in general, particularly in hospital units that assist in procedures aimed at the prevention, control and epidemiological surveillance of Nosocomial infections.

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