

# THE USE OF NEUTRAL ELECTROLYZED OXIDIZING WATER FOR DISINFECTION OF 3.0T MRI SCANNER

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**Key words:** *electrolyzed oxidizing water, Magnetic Resonance Imaging (MRI), disinfection*

## **Purpose**

Disinfection procedures are an important part of preventive measures to prevent the spread of contagious and infectious diseases. Given what we disinfected, and the purpose (prevention, decontamination) should choose an effective biocide [1]. From reliable biocide performance demand quickly with as wide a spectrum of the microorganisms that do not harm the patient and staff should not be residue on the surface, should not affect the surface of materials and must be biodegradable [2].

Especially in recent years faced increasing number of resistant microorganisms. We have contributed to the resistance, both with an inappropriate choice of biocides, and their use (inadequate concentrations, time of performance, and the replacement of biocides). However, obstinate strains of microorganisms, which are becoming increasingly resistant to the procedures of disinfection, have emerged [3-12].

Devices for magnetic resonance imaging represent the specific conditions for disinfection. Among the relevant facts include the presence of electronic equipment in a single device that limits the possibility of selecting the appropriate biocide to disinfect the device. It is also not negligible exposure to the patient surface of the device, particularly contamination of equipment or transfer agent in the surface of the device in a patient or staff [1, 10, 13, 14, 15].

Neutral electrolyzed oxidizing water (NEOW) is a biocide with a broad spectrum of activity, with immediate action on the surface leaves no residue. Because of its physical and chemical mode of action is not expected that the micro-organisms have developed resistance. Natural biocide bound electrons of the surroundings and thus destabilize the bacterial wall micro-electrolysis itself is formed and hyper-oxide ions, which are also disinfecting effect, quickly and without delay. Just as the biocide is a not necessary rinse surface [16, 17].

Since the device for magnetic resonance imaging routinely fails to disinfect, we were interested in this part, how surface of the device loaded with the presence of microorganisms and what effect NEOW of microorganisms in different acceptable ways of spreading on the surface. The purpose of this study was to determine the reliability of NEOW using two different methods of disinfection on 3.0 T MRI Scanner.

## **Methods and Materials**

The experiment was performed at the University Medical Centre Maribor Slovenia in the Department of Radiology. The disinfection of the 3.0 T MRI Signa HDxt Scanner was completed by the procedure indicated by the manufacturer in the technical instructions (sodium hypochlorite solution). The disinfection was completed by using the sprayer and the method of cold fogging. NEOW with redox potential value of 830-850 mV (Steriplant®N, Obisan Institute, Slovenia) was used as a biocide. The experiment tested the number of colony-forming units on the model of *Staphylococcus aureus* ATCC 25923. Test colony of *S. aureus* was applied to test surfaces in the concentration of  $1,5 \times 10^6$ . Cold fogging was performed with the OptiJet CSMD R1 system (Swiss Steriplant AG, Switzerland, and the modification Obisan, Slovenia). Test surfaces were set vertically, horizontally, and on the

ceiling. After 15 minutes the swabs were taken to analyse the total number of colony-forming units in CFU/cm<sup>2</sup> on 20cm<sup>2</sup> of surface.

The experiment was conducted in two stages. We disinfected 3.0 T Signa MRI HDxt by the procedure of the manufacturer in the technical guidance (sodium hypochlorite).

Swabs for determining the total number of microorganisms were taken to 12 cities before and after disinfection. To determine the presence of microorganisms on surfaces, swabs were taken on the surface of 20 cm<sup>2</sup>. As a biocide were used NEOW redox potential of 830-850 mV (Steriplant<sup>®</sup> N, Obisan, Slovenia). Biocide was given by hand sprayer until the surface was visibly wet and waits 5 minutes. He was then taken swabs from the surfaces.

The second stage of the experiment was carried out by the modified method of testing the model of biocides *Staphylococcus aureus* ATCC 25923. Test culture *S. aureus* was application on the test surface at a concentration of 1.5 x10<sup>6</sup> CFU/cm<sup>2</sup>. Then the task is a system of cold fogging OptiJet CS MDR 1(Swiss Steriplant AG, Switzerland and modification Obisan, Slovenia). Test plates were placed vertically, horizontally and ceiling as location areas has an impact on the performance disinfection. After a time of 15 minutes, we took the swabs to test tile and check the count in CFU/cm<sup>2</sup>.

### **Results**

In the first part of the experiment was determined performance NEOW directly on the surface MRI. Control swabs from surfaces MRI showed a relatively low number of microorganisms, which was also the reason for the observed relatively low reduction. However, we are after disinfection to reduce microbial NEOW found over 90% or more than 1log<sub>10</sub> CFU/cm<sup>2</sup>.

In the second part of the experiment were to test the surface with *S. aureus* ATCC 25923 was placed on the surface of the MRI. Test surfaces were exposed to cold fogging disinfection. When used in a quantity NEOW 8 ml/m<sup>2</sup> we found a reduction in the number of microorganisms by an average of 3.32 log<sub>10</sub> CFU/cm<sup>2</sup>.

### **Conclusions**

On the basis of the results of the experiments we have determined efficiency of neutral electrolyzed oxidizing water Steriplant<sup>®</sup>N with small amounts of biocide in *in vivo* conditions for manual surface disinfection, and in cold fogging.

Based on the results of the experiment we can conclude:

- The model of NEOW Steriplant<sup>®</sup> N in practical terms we can see over 90% reduction of microorganisms (> 1log<sub>10</sub> CFU/cm<sup>2</sup>) ground MRI
- Model test microorganism *S. aureus* shows a decrease of 3.32 log<sub>10</sub> CFU/cm<sup>2</sup> (P <0.001), which exceeds the required reduction of micro-organisms in the testing of biocides, even in laboratory conditions
- For efficient operation should be applied in a significant amount of biocide to the surface for efficient operation
- biocide from the surface is not necessary to wash, you can just wipe it or leave it to dry
- NEOW is not corrosive and is effective even when on the surface creates a biofilm.

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### **Personal information**

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