

PROTÓCOLOS DE HIGIENE BUCAL PARA PACIENTES EM UNIDADE DE TERAPIA INTENSIVA

ORAL HYGIENE PROTOCOLS FOR PATIENTS IN INTENSIVE CARE UNIT

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Abstract. This literature review aimed to verify which are the most effective hygiene protocols and oral antiseptics in reducing or preventing ventilator-associated pneumonia (VAP). A search for related articles was carried out in the pubmed and science databases, selecting by title, abstract and full text, excluding those whose theme was not in accordance with the research objective. It was found that although there are several ways to control biofilm, there is still no established protocol for oral hygiene of patients study mechanical ventilation, having identified different methods including the use of various antiseptic products, such as chlorhexidine 0.12, 0.2 and 2%, associated or not with a mechanical method of biofilm removal. In some protocols, the use of more than one substance is suggested, such as hydrogen peroxide, associated with cetylpyridinium chloride or chlorhexidine. However, more comprehensive protocols, involving measures other than mechanical and pharmacological methods, proved to be more efficient in preventing and reducing VAP. Antiseptics are very important for reducing the rate of this infection, although several substances have been tested, chlorhexidine gluconate is the most indicated by the authors.

Keywords: Intensive Care Unit; Oral Antiseptics; Hospital Dentistry.

Resumo. A presente revisão de literatura se propôs a verificar quais são os protocolos de higiene e os antissépticos bucais mais efetivos na redução ou prevenção da pneumonia associada a ventilação mecânica (PAVM). Foi realizada a busca de artigos relacionados nas bases de dados Pubmed e Scielo, selecionando pelo título, resumo e texto completo, excluindo aqueles cujo tema não estava de acordo com o objetivo da pesquisa. Constatou-se que apesar de existirem diversas maneiras de controlar o biofilme, ainda não há um protocolo estabelecido para higienização bucal de pacientes submetidos à ventilação mecânica, tendo sido identificado diferentes métodos incluindo o uso de produtos antissépticos variados, como a clorexidina 0,12, 0,2 e 2%, associada ou não a um método mecânico de remoção do biofilme. Em alguns protocolos, é sugerido o uso de mais de uma substância, como o peróxido de hidrogênio, associado ao cloreto de cetilpiridínio ou à clorexidina. Contudo, os protocolos mais abrangentes, envolvendo outras medidas além dos métodos mecânicos e farmacológicos, se mostraram mais eficientes na prevenção e redução da PAVM. Os antissépticos são muito importantes para a redução da taxa desta infecção, embora diversas substâncias tenham sido testadas, o gluconato de clorexidina é o mais indicado pelos autores.

Palavras-chave: Unidade de Terapia Intensiva; Antissépticos Buciais; Odontologia Hospitalar.

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INTRODUCTION

Patients hospitalized in intensive care units (ICUs) generally have unsatisfactory oral hygiene, which, associated with the use of drugs, can result in changes in salivation and oral pH. This condition promotes the increase of bacteria in the patient's dental biofilm, which results in a biochemical alteration of the oral surface, thus increasing adherence and colonization by respiratory pathogens¹. According to the results of the study by Oliveira et al. ¹ (2007), the colonization of dental biofilm is directly associated with nosocomial pneumonia in patients admitted to ICUs.

The oral condition of patients in a hospital environment is related to several local and systemic factors, such as the use of medications, immunological alterations, use of devices (nasogastric tube , endotracheal , enteral and aspiration tubes), xerostomia, quality of hygiene and age group. With the interaction of these factors, it is essential to carry out a detailed anamnesis and a thorough daily clinical examination to verify the evolution of intraoral signs².

Oral hygiene is extremely important for hospitalized patients, as hyposalivation and maintenance of dental biofilm serve as a reservoir for bacteria that cause distant infections, such as microorganisms associated with nosocomial pneumonia. However, performing biofilm control measures by

nurses and nursing technicians in intensive care units (ICUs) may not be efficient, as there is no knowledge of adequate brushing techniques, especially considering the particular health condition of patients³.

In ICUs, it is difficult to perform oral hygiene mechanically, using a toothbrush and dentifrice. Some studies evaluated the effectiveness of decontaminating the oral microbiota with 0.12% chlorhexidine to reduce the oral colonization of pathogens, preventing cases of nosocomial pneumonia. Rinses with triclosan with fluoride, hydrogen peroxide and 0.2% chlorhexidine were also effective, demonstrating antimicrobial activity ^{1,4}.

However, there is a discussion in the literature about the validity of the evidence on the effectiveness of chlorhexidine 0.12% as an oral antiseptic agent, as it is not effective against Gram-negative pathogens ^{5,6} . Hydrogen peroxide-based antiseptics have been studied in the chemical control of plaque in the last two decades due to their antibacterial effect. This effect seems to be related to the bactericidal action of oxygen in oxygen-sensitive organisms ⁷ . Thus, this literature review aimed to verify which are the oral hygiene protocols and which is the antiseptic agent that has the best effectiveness in the prevention of pneumonia associated with mechanical ventilation (VAP) in patients hospitalized in ICUs.

MATERIAL AND METHODS

Pubmed and Scielo databases with the following keywords "intensive care unit", "oral antiseptics", "oral rinses", "oral/

oral/dental hygiene", "hospital dentistry", in Portuguese and English. Articles relevant to the topic were included, in Portuguese,

English and Spanish. The steps for selecting articles were: first, by the title of the article; second, by the abstract; and, third, by its full text. Articles whose theme was not in

accordance with the objective of this research were excluded. The data were presented in a descriptive way.

Literature review

Nosocomial pneumonia, also called ventilator-associated pneumonia (VAP), is an infection of the lung parenchyma caused by different types of etiological agents, such as bacteria, viruses and fungi. The most common access route for microorganisms is aspiration through the oral cavity. Normally the respiratory tract is able to defend itself through mechanisms such as the cough reflex that helps to expel inhaled particles, for example. However, individuals under intensive care have deficient immunological barriers. Thus, it can be emphasized that dental care in patients under intensive care is essential as an integral part of general health, avoiding systemic disorders⁸.

The prevalence rate of nosocomial infection (HI), as well as the types of infections, pathogens and their sensitivity profile to antimicrobials were evaluated in HI notification forms in a public university hospital, belonging to the Health System of Fortaleza. A total of 512 HAI notification forms that occurred throughout 2007 were analyzed. The average annual HAI rate was 8.2%, with pneumonia being the most frequent nosocomial infection. The hospital microbiota was composed of 25 microorganisms, *Klebsiella pneumoniae*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Acinetobacter* sp., *Escherichia coli*, *Enterobacter* sp. and *Candida* sp. those with the highest incidence. In general, these strains showed resistance above 50%

to traditional antibiotics, thus reinforcing the worldwide concern with the failure of antibiotic therapy and the need to prevent nosocomial infections⁹.

Treatment of the oropharynx and maintenance of favorable hygiene were highlighted as difficult procedures to be performed in patients under intensive care, especially in patients using mechanical ventilation due to difficult access to the oral cavity. According to the nursing teams interviewed in the study, most have little knowledge regarding dental plaque control methods and the various products that can be used in oral hygiene, suggesting the presence of a dental surgeon in an attempt to solve difficulties in maintenance of oral health, which is directly linked to the general health of patients hospitalized in ICUs¹⁰.

Oral hygiene is a significant factor and, when well applied, it reduces infection rates, especially nosocomial pneumonia in patients in intensive care units on mechanical ventilation. According to the authors, nosocomial pneumonia is the most frequent respiratory infection in ICUs, occurring after 48 hours or more of hospitalization and, not being incubated at the time of admission of the patient to the hospital. In view of the bacterial risks arising from the oral cavity, the importance of complete cleaning of its tissues is reinforced, which is generally done in hospitals with 0.12% chlorhexidine¹¹.

The need to use mechanical and/or

pharmacological means of intervention was evident when studies showed that, after 48 hours of admission to the intensive care unit (ICU), all patients had colonization of the oropharynx by Gram-negative bacilli, frequent etiological agents of nosocomial pneumonias, thus, the dental biofilm is considered a significant reservoir of respiratory pathogens¹². When evaluating studies related to hygiene methods in these patients, the authors concluded that the use of 0.12% chlorhexidine and not brushing teeth seems to be the most effective method. However, it reports the need to develop clinical studies with minimal bias to evaluate the most effective protocol in reducing nosocomial pneumonia¹².

A prevention protocol for ventilator-associated pneumonia (VAP) was tested in patients admitted to the intensive care unit (ICU) of the hospital Mercy Medical Center in Springfield, from May 2005 to December 2007. Oral care was performed every four hours as follows: brushing teeth with cetylpyridinium chloride (replaced by chlorhexidine gluconate in 2007) using a suction toothbrush, cotton swabs with hydrogen peroxide to clean teeth and tongue, and lip balm, finding an 89.7% reduction in the rate of ventilator-associated pneumonia (VAP)¹³.

The oral microbiota in critically ill patients becomes predominantly Gram-negative organisms, constituting a more aggressive microbiota, which, when associated with poor oral hygiene, is related to nosocomial pneumonia. Therefore, it is essential to use mechanical and chemical resources for oral hygiene, such as chlorhexidine, the substance most used in hospitals at a concentration of 0.12%, but which can also be used at a concentration of 0.2%, showing better effect, or associated with hydrogen peroxide, which has shown an antibacterial effect against most pathogens

related to ventilator-associated pneumonia¹⁴.

The antimicrobial activity of mouthwashes was evaluated against *Streptococcus mutans*, *Pseudomonas aeruginosa*, *Enterococcus faecalis*, *Staphylococcus aureus* and on bacteria obtained from saliva samples from 10 people. The analyzed antiseptics were: 0.12% chlorhexidine gluconate; 2% chlorhexidine gluconate; cetylpyridinium chloride with and without fluorine; thymol; triclosan with fluorine; mallow extract with fluorine and xylitol and hydrogen peroxide. The technique used was agar diffusion, the orifice plate method, with incubation at 37°C in aerobic and microaerophilic conditions. After incubation, the presence or absence of a growth inhibition zone around the holes was observed. The halo formation demonstrated antimicrobial activity. The results of this study confirmed the efficacy of rinses with hydrogen peroxide, triclosan with fluorine, 0.12% chlorhexidine and 2% chlorhexidine on *Streptococcus mutans*, *Staphylococcus aureus*, *Enterococcus faecalis*, *Pseudomonas aeruginosa*, and facultative mesophilic salivary bacteria. Cetylpyridinium chloride and mauve, fluorine and xylitol exhibited differences in the spectrum of action on bacteria. Mouthrinses with thymol and sodium fluoride, xylitol and thymol association did not demonstrate antimicrobial activity⁴.

One study evaluated the plaque reduction power of a 1.5% hydrogen peroxide-based mouthwash in periodontally healthy individuals without oral hygiene measures. During the period of absence of oral hygiene, each group used one of the following mouthwashes three times a day: hydrogen peroxide 1.5%, chlorhexidine 0.12% and placebo solution. After the end of the experimental periods, the amount of plaque formed on

the dental surfaces of the participants was clinically evaluated. The results indicated that the use of a hydrogen peroxide-based mouthwash can decrease plaque formation in the absence of mechanical measures of oral hygiene without causing any side effects or discomfort. The 0.12% chlorhexidine-based solution was more efficient in preventing dental plaque formation, but all participants reported some degree of change in taste when they swished the solution. In the placebo group, a substantial amount of dental biofilm was formed⁷.

The effectiveness of alcohol-free mouthwashes was compared against *Candida microorganisms albicans*, *Staphylococcus aureus* and *Enterococcus faecalis* that inhabit the oral cavity. The mouthwashes used were triclosan, cetylpyridinium chloride (CPC) and essential oils (EO), which were compared to the activity of 0.12% chlorhexidine. With the purpose of controlling oral biofilm and ensuring an improvement in the oral health of patients, the study shows that the use of mouthwashes associated with mechanical hygiene methods improves the results in oral hygiene. The substances that were most effective in the antiseptic process of the oral cavity were triclosan and chlorhexidine¹⁵.

Three methods of intraoral antiseptic in reducing the number of streptococci in the gingival sulcus were evaluated in one study. Participants were separated into three groups and submitted to one of the following methods: method 1- mouthwash with 15 ml of 0.12% chlorhexidine gluconate for 1 minute; method 2- mouthwash with 15 ml of 0.12% chlorhexidine gluconate for 1 minute, followed by rubbing the buccal, lingual and occlusal surfaces of the teeth with a cotton swab dipped in the same solution; method 3- two mouthwashes with 15 ml of cetylpyridinium chloride at 1:4,000, for 1 minute, interspersed with rubbing the buccal, lingual and occlusal surfaces of the teeth

with a cotton swab soaked in 3% hydrogen peroxide. The results showed the importance of mechanical cleaning of the dental surfaces, as methods 2 and 3, which were an association between mouthwash and cleaning the teeth with a cotton swab, obtained better results at all times observed¹⁶.

Two hygiene protocols in intensive care unit patients were evaluated with the aim of preventing ventilator-associated pneumonia (VAP). One group used a comprehensive oral hygiene treatment regimen that involved brushing, vacuuming, baking soda, rinsing with an antiseptic solution containing 1.5% hydrogen peroxide, and a mouth moisturizer; the second group, however, used a more conventional treatment, which included cleaning with a sponge and atraumatic tweezers and rinsing with a 0.2% solution of chlorhexidine gluconate, both groups carried out cleaning three times a day. Although chlorhexidine gluconate is a potent and very effective antiseptic, treatment with comprehensive oral care was more effective in preventing VAP than conventional protocols¹⁷.

The effectiveness of oral decontamination with chlorhexidine in specific oral care protocols in preventing ventilator-associated pneumonia (VAP) was evaluated with the aim of finding the best dose, frequency and mode of use. This study demonstrated that oral hygiene with chlorhexidine promoted a tendency to prevent VAP when used at a concentration of 2%, while concentrations of 0.12 and 0.2% failed to promote a significant reduction in the incidence of this infection; as for frequency, administration four times a day was the only one to show efficiency, showing no difference between oral care with chlorhexidine alone or associated with brushing¹⁸.

The effects of mechanical (brushing), pharmacological (chlorhexidine 0.12%) and a

combination of both (brushing plus chlorhexidine) oral care were evaluated in patients admitted to three intensive care units (ICUs) of the Virginia Commonwealth University Medical Center hospital . The study concluded that chlorhexidine 0.12% twice a day, not associated with brushing, reduced ventilator-associated pneumonia, whereas the brushing protocol had no significant effect and the combination of brushing with chlorhexidine did not provide additional benefit in relation to chlorhexidine alone¹⁹ .

Some authors have developed a bundle (package) for the prevention of pneumonia associated with mechanical ventilation, which included oral hygiene with 0.12% chlorhexidine, elevation of the head of the bed between 30-45°, cuff (cuff) between 20-30 cm H₂O and care with aspiration of secretions. Although there are no consistent recommendations in the literature to determine the ideal technique for oral hygiene, the authors developed a method that consists of using gauze soaked in 0.12% chlorhexidine and cleaning the entire oral cavity, teeth and tongue. The technique must be performed with the head of the bed elevated at 30-45°, aspiration of oral secretions and checking cuff pressure to keep in 20-30 cm of H₂O²⁰ .

Ventilator-associated pneumonia (VAP), which ranks second in the records

of Healthcare-Related Infections (HAI), can be avoided with some preventive measures such as cleaning with 0.12% to 2% chlorhexidine, at least three times a day, removal of oral secretions before changing position, use of the tube with an intermittent subglottic aspiration system , among others. Adherence to these practices decreases the risk of colonization of the oropharynx and stomach by microorganisms that result in the development of VAP²¹ .

The cleaning of the oral cavity by professionals in patients in the Intensive Care Unit is of great importance, because during the use of mechanical ventilation, oral hygiene is quite compromised due to the lack of chewing, mainly of hard and fibrous foods, which promote natural cleaning from the mouth. In the study, the authors indicate chlorhexidine 0.12% as the substance of choice for cleaning the oral cavity, at least twice a day, due to its antimicrobial action, effectiveness on aerobic and anaerobic bacteria and ability to be absorbed by the oral mucosa. and by the teeth, and released in up to 12 hours, reducing the accumulation of dental plaque, without the need for toothbrushing²² .

Table 1 presents a summary of the studies included in this literature review:

Table 1. Oral hygiene protocols for hospitalized patients.

| Authors | Protocol | frequency per day | product of choice |
|---------------------|---|-------------------|---------------------|
| Barros et al., 1998 | mouthwash for 1 minute | did not inform* | chlorhexidine 0.12% |
| Barros et al., 1998 | mouthwash for 1 minute, followed by rubbing the buccal, lingual and occlusal surfaces of the teeth with a cotton swab soaked in the same solution | did not inform* | chlorhexidine 0.12% |

| | | | |
|-----------------------|---|---|---|
| Barros et al., 1998 | two 1-minute mouthwashes, interspersed with rubbing the buccal, lingual and occlusal surfaces of the teeth with a cotton swab soaked in hydrogen peroxide | did not inform | cetylperidinium chloride + 3% hydrogen peroxide |
| Quiles et al., 2007 | mouthwash without oral hygiene | 3 | 1.5% hydrogen peroxide |
| Quiles et al., 2007 | mouthwash without oral hygiene | 3 | chlorhexidine 0.12% |
| Quiles et al., 2007 | mouthwash without oral hygiene | 3 | Placebo |
| Hutchins et al., 2009 | toothbrush with suction, cotton swabs soaked in hydrogen peroxide and lip balm | 6 (4 in 4 hours) | cetylperidine chloride + hydrogen peroxide |
| Amaral et al., 2009 | rinse and brushing | did not inform | chlorhexidine 0.12% |
| Amaral et al., 2009 | rinse and brushing | did not inform | chlorhexidine 0.2% |
| Amaral et al., 2009 | rinse and brushing | did not inform | chlorhexidine associated with hydrogen peroxide |
| Munro et al., 2009 | not associated with brushing | two | chlorhexidine 0.12% |
| Munro et al., 2009 | only brushing | 3 | chlorhexidine 0.12% |
| Munro et al., 2009 | rinse and brushing | brushing 3 and chlorhexidine every 12 hours | chlorhexidine 0.12% |
| Silva et al., 2012 | gauze soaked in the solution and cleaning throughout the oral cavity, teeth and tongue | did not inform* | chlorhexidine 0.12% |
| Lev et al., 2015 | brushing, vacuuming, washing with antiseptic and mouth moisturizer | 3 | baking soda + hydrogen peroxide |
| Lev et al., 2015 | cleaning with sponge and atraumatic tweezers and rinsing with antiseptic | 3 | chlorhexidine 0.12% |
| Vilela et al., 2015 | not associated with brushing | did not inform* | chlorhexidine 0.12% |
| Villar et al., 2016 | with or without brushing | 4 | 2% chlorhexidine |
| Villar et al., 2016 | with or without brushing | 4 | chlorhexidine 0.2% |
| Villar et al., 2016 | with or without brushing | 4 | chlorhexidine 0.12% |
| Melo et al., 2019 | hygiene (did not specify whether with or without brushing) | two | chlorhexidine 0.12% |
| Maier et al., 2020 | hygiene (she did not specify whether with or without brushing) and aspiration of oral secretions | 3 | chlorhexidine 0.12% to 2% |

Discussion:

In Intensive Care Units (ICU), patients commonly have difficulty performing oral hygiene due to their hospitalization conditions and physical and psychological weakness. Nurses and caregivers are also often unable to perform good hygiene or have questions regarding the best hygiene protocol and the most effective substances against microorganisms present in the oral cavity of patients in this condition. Inadequate or absent hygiene can directly interfere with the patient's general health, aggravating the systemic condition. The present study reviewed the scientific literature in order to verify which oral hygiene protocols are more effective in reducing or preventing ventilator-associated pneumonia (VAP) in patients hospitalized in ICUs and to verify the effectiveness of different oral antiseptics in reducing or preventing of nosocomial pneumonia (VAP) in these patients.

Various oral hygiene protocols are described in the literature. In the present review, the main protocols were identified: (1) chlorhexidine (CHX) 0.12%, without toothbrushing, twice^{12,16,19} or three times a day⁷; (2) CHX 0.12% associated with brushing^{14,19} or rubbing tooth surfaces^{16,17,20}; (3) cleaning with 0.12% chlorhexidine, at least three times a day^{18,19} or associated with aspiration of oral secretions²¹; (4) 2% chlorhexidine, four times a day¹⁸; (5) 0.12% chlorhexidine associated with hydrogen peroxide¹⁴; (6) brushing teeth with cetylpyridinium chloride (replaced by chlorhexidine gluconate in 2007) using a suction toothbrush, cotton swabs with hydrogen peroxide to clean teeth and tongue, and lip balm every four hours¹³; (7) 1:4,000 cetylpyridinium chloride, two mouthwashes for 1 minute, interspersed with rubbing

the buccal, lingual and occlusal surfaces of the teeth with a cotton swab soaked in 3% hydrogen peroxide¹⁶; and, (8) brushing, aspiration, sodium bicarbonate, rinsing with an antiseptic solution containing 1.5% hydrogen peroxide and a mouth moisturizer¹⁷.

Among the oral hygiene protocols for the prevention or reduction of ventilator-associated pneumonia (VAP), Munro et al.¹⁹ (2009) and Vilela et al.¹² (2015) only indicated the use of 0.12% chlorhexidine gluconate solution, twice a day, without association with mechanical hygiene methods. For the authors, brushing did not present any additional benefit in relation to the use of chlorhexidine alone. However, the association between mechanical and pharmacological hygiene methods is indicated by several authors^{13-17,20,21}. Barros et al.¹⁶ (1998) concluded that protocols with chlorhexidine gluconate and cetylpyridinium chloride mouthwash associated with cleaning with friction with a cotton swab soaked in 3% hydrogen peroxide obtained better results in all observed working times. Amaral et al.¹⁴ (2009) and Gonçalves and Pinto¹⁵ (2013) consider essential the use of mechanical hygiene methods associated with pharmacological methods, the substance of choice being chlorhexidine gluconate in concentrations of 0.12% or 0.2%, or associated to hydrogen peroxide and, chlorhexidine and triclosan, respectively. Moreira et al.⁴ (2009) also proved the effectiveness of mouthwashes with hydrogen peroxide, triclosan with fluorine and 0.12% and 2% chlorhexidine on *Streptococcus mutans*, *Staphylococcus aureus*, *Enterococcus faecalis*, *Pseudomonas aeruginosa*, and facultative mesophilic salivary bacteria.

Although conventional protocols are

used more frequently, some studies agree that more comprehensive treatments have better results in preventing VAP^{13,17,20}. Hutchins et al.¹³ (2009) and Barros et al.¹⁶ (1998) described a protocol involving brushing with cetylpyridinium chloride or chlorhexidine gluconate with a toothbrush and suction, cotton swabs with hydrogen peroxide and lip moisturizer, suggesting a significant reduction in the rate of this infection. Lev et al.¹⁷ (2015) described the same protocol with the addition of sodium bicarbonate. Silva et al.²⁰ (2012) also described a more comprehensive technique, involving, in addition to the mechanical and pharmacological cleaning method with chlorhexidine 0.12%, the careful performance of the procedure, with the head of the bed elevated at 30-45°, aspiration of oral secretions and checking cuff pressure (cuff) to keep at 20-30 cm of H₂O.

Among the antiseptic products used for oral hygiene of hospitalized patients, the present literature review verified that the following may be indicated: (1) chlorhexidine, in concentrations of 0.12%^{12,16,19-22} or 2%^{4,21}; (2) chlorhexidine, at concentrations of 0.12% or 0.2% associated with hydrogen peroxide^{7,14}; (3) cetylpyridinium chloride associated or not with 3% hydrogen peroxide^{13,16}.

Gluconate, despite several studies showing the effectiveness of other substances, remains the most indicated mouthwash. Melo et al.²² (2019) indicate chlorhexidine as the substance of choice due to its microbial action, effectiveness on aerobic and anaerobic bacteria, and ability to release for 12 hours. Maier et al.²¹ (2020) indicate 0.12 to 2% chlorhexidine mouthwash, three times a day, removal of oral secretion before changing position as a preventive measure for VAP, however, according to the study by Villar et al.¹⁸ (2016) chlorhexidine has this effect only at a concentration of 2% while concentrations of 0.12 and 0.2% fail to promote a reduction in the

incidence of this infection.

Quiles et al.⁷ (2007) indicated that the use of hydrogen peroxide-based mouthwashes has the capacity to reduce the formation of dental plaque in the absence of mechanical measures of oral hygiene, without showing any side effects or discomfort, while chlorhexidine, which presented more efficient, had as a side effect changes in taste after mouthwash.

In a study carried out by Moreira et al.⁴ (2009) the antiseptics hydrogen peroxide, triclosan with fluorine, 0.12% chlorhexidine and 2% chlorhexidine showed antimicrobial action against *Streptococcus mutans*, *Staphylococcus aureus*, *Enterococcus faecalis*, *Pseudomonas aeruginosa*, and facultative mesophilic salivary bacteria. Cetylpyridinium chloride and mallow, fluorine and xylitol showed differences in the spectrum of action on bacteria⁴.

The present review demonstrated that, although several ways to control dental biofilm are available, there is no well-established protocol for oral hygiene in patients undergoing mechanical ventilation, and different methods have been identified. This fact can be negative, as the professional involved in the care of individuals in the ICU may have difficulty defining the most appropriate protocol for patients. On the other hand, the good results obtained in reducing VAP, in most studies, demonstrate that the most important thing is to perform oral hygiene, regardless of the ideal protocol. The professional must be up to date and confident in their decisions when in a complex work environment such as the hospital environment.

Conclusion:

The present study concluded that although there is no established protocol for the reduction or prevention of ventilator-associated pneumonia (VAP) in patients hospitalized in Intensive Care Units (ICU), the most comprehensive methods involving other care besides toothbrushing, such as aspiration of oral secretions and cleaning of the entire oral

cavity, teeth and tongue, show a significant reduction in the rates of this infection. Pharmacological methods are also effective in controlling plaque, with chlorhexidine being the most indicated and effective substance for controlling microorganisms associated with VAP.

References:

1. Oliveira LCBS, Carneiro PPM, Fischer RG, Tinoco EMB. A presença de patógenos respiratórios no biofilme bucal de pacientes com pneumonia nosocomial. *Rev Bras Ter Intensiva* 2007; 19(4): 428-433
2. Eduardo FDP, Bezinelli LM, Corrêa L. *Odontologia hospitalar*. Barueri – SP: Manole, 2019.
3. Souza ERL, Cruz JHA, Gomes NML, Palmeira JT, Oliveira HMBF, Guênes GMT et al. Fisiopatologia da pneumonia nosocomial: uma breve revisão. *Arch Health Invest* 2020; 9(5):485-492.
4. Moreira ACA, Pereira MHQ, Porto MR, Rocha LAP, Nascimento BC, Andrade PM. Avaliação in vitro da atividade antimicrobiana de antissépticos bucais. *Rev Ci Méd Biol* 2009; 8(2):153-161.
5. Berry AM, Davidson PM, Masters J, Rolls K. Systematic literature review of oral hygiene practices for intensive care patients receiving mechanical ventilation. *Am. J Crit Care* 2007; 16(6):552-562.
6. Ferreira H, Garcia LB, Marrone FEC, Tognim MCB, Cardoso CL. Susceptibilidade de amostras clínicas de *Pseudomonas aeruginosa* a antibióticos e a clorexidina. *Rev Epidemiol Control Infect* 2014; 4(4):243-248.
7. Quiles JC, Salazar BL, Salazar M, Araújo MG. Efeito do uso de Peroxyl® na redução da formação de placa bacteriana. *Rev Dental Press Periodontia Implantol* 2007; 1(2):26-34.
8. Barbosa JCS, Lobato OS, Menezes SAF, Menezes TOA, Pinheiro HHC. Perfil dos pacientes sob terapia intensiva com pneumonia nosocomial: principais agentes etiológicos. *Rev Odontol UNES*. 2010; 39(4):201-206.
9. Nogueira PSF, Moura ERF, Costa MMF, Monteiro WMS, Brondi L. Perfil da infecção hospitalar em um hospital universitário. *Rev Enferm. UERJ* 2009; 17(1):96-101.
10. Araújo RJG, Oliveira LCG, Hanna LMO, Corrêa AM, Carvalho LHV, Alvares NCF. Análise de percepções e ações de cuidados bucais realizados por equipes de enfermagem em unidades de tratamento intensivo. *Rev Bras Ter Intensiva* 2009; 21(1):38-44.

11. bSchlesener VRF, Dalla Rosa U, Raupp SMM. O cuidado com a saúde bucal de pacientes em UTI. *Cinergis* 2012; 13(1): 72-77.
12. Vilela MCN, Ferreira G Z, Santos PSS, Rezende N P M. Cuidados bucais e pneumonia nosocomial: revisão sistemática. *Einstein* 2015; 13(2):291-296.
13. Hutchins K, Karras G, Erwin J, Sullivan K L. Ventilator -associated pneumonia and oral care: a successful quality improvement project. *Am J Infect Control* 2009; 37(7):590-597.
14. Amaral SM, Cortês AQ, Pires FR. Pneumonia nosocomial: importância do microambiente oral. *J Bras Pneumol* 2009; 35(11):1116-1124.
15. Gonçalves EA, Pinto PF. Avaliação da eficácia antimicrobiana dos enxaguatórios bucais contendo como princípios ativos o triclosan, cloreto de cetilpiridínio e óleos essenciais. *HU Revista* 2013; 39(3/4):45-50.
16. Barros VMR, Ito IY, Azevedo RVP, Morello D, Rosateli PA. Estudo comparativo da eficiência de três métodos de anti-sepsia intrabucal na redução do número de streptococos do sulco gengival. *Rev Odontol Univ São Paulo* 1998; 12(3):201-206.
17. Lev A, Aied AS, Arshed S. The effect of different oral hygiene treatments on the occurrence of ventilator associated pneumonia (VAP) in ventilated patients. *J Infect Prev* 2015; 1 (2):76-81.
18. Villar CC, Pannuti CM, Nery DM, Morillo CMR, Carmona MJC, Romito GA. Effectiveness of Intraoral Chlorhexidine Protocols in the Prevention of Ventilator-Associated Pneumonia: Meta-Analysis and Systematic Review. *Respiratory Care* 2016; 61(9):1245-1259.
19. Munro CL, Grap MJ, Jones DJ, McClish DK, Sessler CN. Chlorhexidine, toothbrushing and preventing ventilator-associated pneumonia in critically ill adults. *Am J Crit Care* 2009; 18(5):428-437.
20. Silva SG, Nascimento ERP, Salles RK. Bundle de prevenção da pneumonia associada à ventilação mecânica: uma construção coletiva. *Texto Contexto Enferm* 2012; 21(4):837-844.
21. Maier SRO, Valim MD, Santos BS, Júnior JRS, Carrijo MVN. Pneumonia associada à ventilação mecânica: evidências científicas. *Rev epidemiol Controle Infecç* 2020; 10(3):103-114.
22. Melo MM, Santiago LMM, Nogueira DL, Vasconcelos MFP. Pneumonia associada à ventilação mecânica: conhecimento dos profissionais de saúde acerca da prevenção e medidas educativas. *Rev Fund Care Online* 2019; 11(n. esp):377-382.