

# The effectiveness of the use of plastic wrapping on dental unit work desks on the number of bacterial colonies in Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, University of North Sumatra (USU)



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## Abstract

**Objective:** The purpose of this research was to determine the effectiveness of the use of plastic wrapping on dental unit work desks on the number of bacterial colonies in Department of Oral and Maxillofacial Surgery Faculty of Dentistry USU.

**Material and Methods:** In this study, sampling was carried out on tooth extraction patients in the Oral and Maxillofacial Surgery Department by using 2 dental chair units where one of the dental unit work desks used plastic wrap and the other did not. Then examination

of the number of bacterial colonies was carried out in Microbiology Laboratory, Faculty of Mathematics and Natural Science USU.

**Results:** Samples taken as many as 50 samples (25 pre-test samples and 25 post-test samples) in 5 different days showed a significant difference in the number of bacterial colonies ( $p < 0.05$ ).

**Conclusion:** This study showed that there was a significant decrease in the number of bacterial colonies in the dental unit work desks that used plastic wrap compared to those that do not.

**Keywords:** Infection control, Number of bacterial colonies, Plastic wrap

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## Introduction

Dentistry is the one of the health care that have a high risk of cross contamination.<sup>1,2</sup> In performing dental care, it can be ascertained to be exposed to saliva, blood, air and water, which is a source of infection for various pathogenic microbes, the most common being hepatitis B virus (HBV), hepatitis C (HCV), tuberculosis (TB) and immunodeficiency syndrome (AIDS).<sup>1,2</sup> The dental health personnel which infected from patients. The environment of dentistry and equipment that is owned does not escape the contamination of microorganisms.<sup>1,2</sup> Contamination of the clinical surface of the dental be the particular concern, because the microorganisms that can live on these surfaces have the potential to become reservoirs for infection.<sup>3,4</sup> The surface can be direct contamination of the liquid release by the patient (saliva and blood) spray or splash during dental treatment or contact with health personnel gloves.<sup>3,4</sup> The environment in dental practice that can be a reservoir for bacteria to live, survive and multiply is called as a dental unit. Dental Chair Unit (DCU) is a complex medical device, designed to provide the equipment and services needed for the supply of various dental treatments. Because DCU uses in

the care of patients in succession throughout the day, microbial contamination in certain parts is a source of cross infection.<sup>1</sup>

Infection control is the main problem in dentistry.<sup>5</sup> Not a few practices and dental health service units that have not applied the standard precaution and good infection control. This is the same case with the research of Dewant et al.<sup>6</sup> who reported that the implementation of infection control in dental practices in the city of Yogyakarta only ranged from 53.33% only.<sup>6</sup> Suleh et al.<sup>7</sup> reported prevention and control Cross infection in the extraction of teeth at the Dental Hospital of Medical Faculty Universitas Sam Ratulangi was only carried out at 48.23%.<sup>7</sup> It has also happend in the Department of Oral and Maxillofacial Faculty of Dentistry University of North Sumatra. Dental chair unit cleaned up in the last work on that day, used soap and alcohol 70% and it didn't use protective layer. This action is not recommended by infection control standard in dental clinics and practices. Dental chair unit must be clean up by using disinfectant that has registered with the Environmental Protection Agency (EPA) then use plastic wrap. This is done every morning before the

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patient is first treated, between patients, and after the last work on that day.<sup>3,8-10</sup>

Based on the description above, the authors are interested in knowing the effectiveness of the use of plastic wrapping on dental unit work desks on the number of bacterial colonies in Department of Oral and Maxillofacial Surgery Faculty of Dentistry University of North Sumatra.

## Material and Methods

In the morning, the dental chair unit is prepared in advance by cleaning thoroughly or large pickets. Dental chair unit one held by Koass, disinfection is carried out according to the method applied in the department. Cleaned up by using soapy water, then wiped it and then use alcohol spray 70% and then wiped again, the worktable of dental unit left not using plastic wrap. Dental chair unit held by the researchers. It cleaned up with disinfection spray clorox clean-up cleaner+ bleach original then wiped it by using clorox disinfecting wipes<sub>1</sub>, after that the dental unit work desks wrapped in plastic wrap bagus PVC cling wrap. The first patient was extracted from the dental chair units one and two. Swab the dental unit work desks 1 with a cotton swab, then putted the cotton swab into a sterile test cube containing NaCl. Labeled with 'Sebelum 1' for naming the sample of the first patient at the dental work desks that did not use plastic wrap. Opened the plastic wrap on the dental unit work desks 2, swab the dental unit work desks 2 with a cotton swab, then putted the cotton swab into a sterile test cube containing NaCl. Labeled 'Sesudah 1' for naming the sample of the first patient at the dental work desks that used plastic wrap.

After that, the worktable dental unit 1 cleaned up by using alcohol 70% and the dental unit work desks 2 by using disinfection Clorox Clean-Up Cleaner + Bleach Original then wiped it using Clorox Disinfecting Wipes<sub>1</sub>, and then wrapped with plastic wrap Bagus PVC Cling Wrap. The second patient was extracted from the dental chair units 1 and 2. Swab to get samples 'Sebelum2' and 'Sesudah 2'. On the worktable dental unit 2, opened the plastic wrap first. Then did the steps again until you get samples 'Sebelum 5' and 'Sesudah 5'. Took the sample into the microbiology laboratory in FMIPA for the manufacture of bacterial

48 hours, the number of bacterial colonies can be calculated.

## Results

Based on the observation of this study, on the first day the average number of bacterial colonies in the group before treatment without using plastic wrap was  $68400 \pm 40084.90$  CFU/ml and the group after treatment using plastic wrap was  $400 \pm 547.72$  CFU/ml. The difference of average number of bacterial colonies in the group before and after being  $68000 \pm 40404.20$  CFU/ml. The results of the analysis with paired t test showed a value of  $p=0.020$  ( $p<0.05$ ), where the results were significant [table 1](#).

On the second day the average number of bacterial colonies in the group before was  $81400 \pm 63449.19$  CFU/ml and the group after was  $400 \pm 894.42$  CFU/ml. The difference of average number of bacterial colonies in the group before and after being  $81000 \pm 63671.02$  CFU/ml. The results of the analysis with paired t test showed  $p=0.047$  ( $p<0.05$ ), where the results were significant [table 2](#).

On the third day the average number of bacterial colonies in the group before was  $69200 \pm 10207.84$  CFU/ml and the group after was  $400 \pm 547.72$  CFU/ml. The difference of average number of bacterial colonies in the group before and after being  $68800 \pm 10329.56$  CFU/ml. The results of the analysis with paired t test showed  $p=0.000$  ( $p<0.05$ ), where the results were significant [table 3](#).

On the fourth day the average number of bacterial colonies in the group before was  $70600 \pm 9502.63$  CFU/ml and the group after was  $400 \pm 547.72$  CFU/ml. The difference of average number of bacterial colonies in the group before and after being  $70200 \pm 9602.08$  CFU/ml. The results of the analysis with paired t test showed  $p=0.000$  ( $p<0.05$ ), where the results were significant [table 4](#).

On the fifth day the average number of bacterial colonies in the group before was  $68200 \pm 29727.09$  CFU/ml and the group after was  $400 \pm 894.42$  CFU/ml. The difference of average number of bacterial colonies in the group before and after being  $67800 \pm 28908.47$  CFU/ml. The results of the analysis with paired t test showed  $p=0.006$  ( $p<0.05$ ), where the results were significant

**Table 1** Sample results and after on the first day

Group	n	Average of number bacteria ( $\bar{x} \pm SD$ ) (CFU/ml)	Difference in bacterial decline ( $\bar{x} \pm SD$ ) (CFU/ml)	Statistical test results (p)
Before	5	$68400 \pm 40084.90$	$68000 \pm 40404.20$	0.020
After	5	$400 \pm 547.72$		

**Table 2** Sample results and after on the second day

Group	n	Average of number bacteria ( $\bar{x} \pm SD$ ) (CFU/ml)	Difference in bacterial decline ( $\bar{x} \pm SD$ ) (CFU/ml)	Statistical test results (p)
Before	5	81400 ± 63449.19	81000 ± 63671.02	0.047
After	5	400 ± 894.42		

**Table 3** Sample results and after on the third day

Group	n	Average of number bacteria ( $\bar{x} \pm SD$ ) (CFU/ml)	Difference in bacterial decline ( $\bar{x} \pm SD$ ) (CFU/ml)	Statistical test results (p)
Before	5	69200 ± 10207.84	68800 ± 10329.56	0.000
After	5	400 ± 547.72		

**Table 4** Sample results and after on the fourth day

Group	n	Average of number bacteria ( $\bar{x} \pm SD$ ) (CFU/ml)	Difference in bacterial decline ( $\bar{x} \pm SD$ ) (CFU/ml)	Statistical test results (p)
Before	5	70600 ± 9502.63	70200 ± 9602.08	0.000
After	5	400 ± 547.72		

**Table 5** Sample results and after on the fifth day

Group	n	Average of number bacteria ( $\bar{x} \pm SD$ ) (CFU/ml)	Difference in bacterial decline ( $\bar{x} \pm SD$ ) (CFU/ml)	Statistical test results (p)
Before	5	68200 ± 29727.09	67800 ± 28908.47	0.006
After	5	400 ± 894.42		

## Discussion

Based on the result of this study, it showed a significant difference between the group before treatment without using plastic wrap and the group after treatment using plastic wrap, the results showed the decrease in the number of bacterial colonies on the first, second, third, fourth, fifth days. Examined the effectiveness of the cling film as a protective layer in the clinical dental environment. The dental unit work desks coated with plastic wrap for 10 clinical sessions only showed the contamination with average the number of bacterial 1-7 CFU/100cm<sup>2</sup>.<sup>11</sup> These results also suitable with research of Kurita et al.<sup>5</sup> which examined methicillin-resistant nosocomial transmission of *Staphylococcus aureus* from the operative dental surface. After the patient treated according to the infection control protocol, including using a single-use protective layer, MRSA was not detected on the operative dental surface and no nosocomial infection or colonization occurred during hospitalization (0/117 patients). The decontamination protocol using a single-use protective layer reduces MRSA surface contamination to >99%. Reducing the density of the dental chair with a baseline of 12.81 ± 2.40 to 0.030 ± 0.010 CFU/cm<sup>2</sup>.<sup>12</sup>

In this study, disinfection used was clorox clean-up cleaner+bleach original that has sodium

content hypochlorite 1.84% with the EPA Reg. NO. 5813-21 registered in list D (EPA's registered antimicrobial product effective against human HIV-1 virus and hepatitis B virus) and clorox disinfecting wipes, has the contents of n-alkyl dimethyl benzyl ammonium chloride 0.184 % and n-alkyl ethylbenzyl ammonium chloride 0.184% with EPA reg. No. 5813-79 registered in list C (EPA's registered antimicrobial product effective against human HIV-1 virus). Both of disinfection have the strange in the same level included in EPA-registered low-level disinfectant. Then the surface of dental unit work desks that has been cleaned is wrapped using with plastic wrap bagus PVC cling wrap yang containing PolyVinyl Chloride (PVC).<sup>3,10</sup>

Plastic wrap uses in the critical parts of a dental chair unit, which is the surface has the big contamination, it is difficult to clean adequately or cannot be autoclaved and the surface that cannot be in contact with disinfectants. Like the lamp holder and various control buttons on DCU. In this study, the surface of dental chair unit used as the sample of the research was a dental unit work desk. Because it has 1 flat surface area which makes it easy to carry out infection control procedures, namely disinfectant applications and the use of plastic wrap. Besides

that, it's also easier to take samples by swab and to observe well, so that it can avoid bias.<sup>8,9,11</sup>

This study used a method of "spray, wipe, spray, then wipe again" which is more practical to use to all of surface dental chair unit especially in parts that have a flat or curved surface area, also more effective to kill microorganism. The ideal disinfectant is the disinfectant which is registered with EPA with format EPA Reg.No. registered product will have information about content of active ingredients of the product, safe for human, things and the environment, how to use and how the product is determined by the manufacturer and the product has been classified its ability to kill certain specific microorganisms. This is also recommended by the CDC.<sup>10</sup>

This study serves to provide information about infection control standards on the surface of the DCU. DCU was cleaned/disinfected in the morning before use, between patients/each patient and after the last patient on that day. The use of disinfectants needs to be considered and the critical parts of the DCU use plastic wrap. Infection is a very real danger in the practice of dental services that looks like an iceberg phenomenon, where the official report on the number of cases does not reflect the real problem.<sup>13</sup> Chain of infection that contains six elements, namely: infectious agent, reservoir, portal of exit from reservoir, mode of transmission, portal of entry to host and susceptible host. This process, called the chain of infection, can only occur when all six links in the chain are intact. By breaking this chain at any of the links, the spread of infection is stopped. The element of host vulnerability is an important element in society. Infection chains often break up at this links. Resistance to bacterial infections is enhanced by phagocytic cells and an intact immune system. Initial resistance is due to non-specific mechanisms. Specific immunity develops over time. These defenses include the antibacterial factors in secretions covering mucosal surfaces and rapid rate of replacement of skin and mucosal epithelial cells. Bacteria invading tissues encounter phagocytic cells that recognize them as foreign, and through a complex signaling mechanism involving interleukins, eicosanoids, and complement, mediate an inflammatory response in which many lymphoid cells participate.<sup>13,14</sup>

## Conclusion

According to the result above, this study concludes that the use of plastic wrap on the dental unit work desks is effective in decreasing the number of bacteria

North Sumatra. Besides that, complete disinfection including the use of disinfectants and plastic wrappers can improve the effectiveness of infection control on the surface of the dental chair unit.

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## Conflict of Interest

The authors report no conflict of interest.

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