

## Can Oral Debris on Dental Instruments Harbor Organisms from Disinfection?

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### Abstract

**Background and Aim:** Reusable dental instruments are continually contaminated with debris and body fluids, which require cleaning decontamination and sterilization prior to re-use. This study was aimed to assess if remaining blood and debris on instruments can prevent instruments from being fully disinfected and sterilized because of harboring microorganisms and impeding disinfectant penetration.

**Materials and Methods:** 42 unwashed contaminated instruments were collected in the case group, while 42 washed contaminated instruments formed the control group. Samples were collected in 2 separate sterile trays, and then submerged in 2% Hydrogen Peroxide (NanoSil) for 3 hours. Sterile swabs impregnated with Trypticase Soy Broth (TSB) were used for sampling. Specimens were transferred to mediums before incubating for 24 hours at 37°C. Samples with bacterial growth were transferred to blood agar, chocolate agar and McConkey agar to identify bacterial species.

**Results:** There was 100% absence of bacterial growth in control samples, while unwashed instruments showed 28.6% (12 samples) presence of growth.

**Conclusion:** This study indicates that remaining blood and debris on instruments may shelter microorganisms. Thus soaking contaminated instruments in disinfectant within the required time and washing them properly via a mechanical system before autoclaving, develops a discreet, secure sterilizing method with the highest success.

**Keywords:** Oral debris; Dental instruments; Nanosil; Sterilization

### Introduction

Disinfecting contaminated dental instruments is one of the main concerns in our society; this contamination can increase the incidence of special infectious diseases among healthcare personnel (HCP) as compared to that of the society [1]. One study suggested that 14 to 28 percent of dentists, 13 percent of assistants and 17 percent of dental hygienists have shown evidence of infection with HBV and each year more than 200 HCP in America die from early or late complications of HBV caused by environment [2]. Blood and saliva contain numerous kinds of viruses, bacteria and other pathogens which may cause diseases such as Flu, Herpes, Pneumonia, Tuberculosis, Hepatitis B and AIDS. This clarifies the urgent need of infection control by HCP [3]. Using different methods to decrease or eliminate the microorganisms is vital for preventing cross-infection [1]. Since sterilization can not be replaced by disinfection [4], reusable instruments must be sterilized after disinfection in order to eliminate microbes and spores [2]. With regard to various types of disinfectants we decided to study the effect of 2% Hydrogen peroxide-silver (Nanosil) on unwashed dental instruments to assess its penetration.

### Materials and Methods

NanoSil by Kimiya Faam Pharmaceutical, Iran is a new disinfectant with a combination of hydrogen peroxide and silver ions. There were 84 samples in this our study; 42 study samples consisting of contaminated instruments, which were disinfected by NanoSil without being washed and 42 control samples, which were washed before disinfecting. Every step was done over sterile drape and in the vicinity of direct flame. Samples were soaked in NanoSil in two separate trays which were already autoclaved. They were kept in containers for 180 minutes. Then sampling was done by sterile swabs impregnated with Trypticase Soy Broth (TSB). Swabs were located in 5CC tubes containing broth. Samples were transferred to Mediums before being placed in incubator at 37°C for 24 hours. The presence or absence of growth was later surveyed by a microbiologist. If the bacterial growth was positive, samples were transferred to blood agar, chocolate agar and McConkey agar mediums to identify bacterial species.

### Results

Control samples showed 100% absence of growth while in study samples 28.6% presence of growth of microorganisms (*staphylococcus*, *streptococcus*,...) was observed. In other words in unwashed group

30/42 samples or 71.4% were without contamination and 12/42 samples or 28.6% were contaminated. Fisher test showed that the difference was statistically significant. ( $P < 0.000$ ) Soaked unwashed contaminated surgical instruments in NanoSil harbored microorganism growth (A.R = 28.6) (Table 1).

Washing	Microorganism Growth		
	Lack of growth	Growth	Total
Washed	42 (100)	0 (0)	42 (100)
Unwashed	30 (71/4)	12 (28/6)	42 (100)

Table 1: Dental instruments contamination.

## Discussion

Preventing disease transmission in reusable instruments is one of the most controversial steps in dental offices infection control [5]. Potent deadly pathogens such as HIV and HBV increased the importance of preventing infection and control. Therefore eliminating blood and debris is essential to ensure the sterilization [6].

In an effort to assess the role of washing, soaking and disinfecting surgical instruments with NanoSil, the current study cultured 42 case samples (disinfected without washing) and 42 control sample (disinfected after washing) using 2% Hydrogen peroxide-silver (nanosil); 28.6% bacterial growth was observed in case samples, which were disinfected without being washed, While there was no contamination in control samples which were washed.

Among in-office cleaning procedures available, soaking instruments in liquid disinfectants before autoclaving is an acceptable method to prevent drying of blood and debris [6].

Our study showed that NanoSil was not able to eliminate microbes in unwashed surgical instruments, after being soaked for 3 hours. However whether or not remaining blood and debris on instruments can harbor microorganisms by impeding the penetration of disinfectants had not been assessed. Many studies discussed the same issue with various solutions [6-14], hence we sought to assess this using a peroxide based disinfectant.

With regard to current disinfectants it should be noted that each have their own advantages and disadvantages. For example Betadine is nontoxic but has a yellow color. Sodium Hypochlorite has a pungent smell and can corrode dental hand pieces. Nanosil is ecofriendly odorless and non-toxic

SanoSil is a new generation of disinfectants composed of hydrogen peroxide and small amounts of silver made originally by SanoSil Company in Switzerland. Unlike most disinfectants, SanoSil is non-corrosive with no color or odor [7]. It should be noted that Nanosil, longevity, concentration and soaking time can affect effectiveness. For

instruments in direct contact with patients, these solutions can only be used for soaking and pre-cleaning before autoclaving. Surfaces and non-critical instruments that cannot be autoclaved must be covered and disinfected because they can harbor microbes that should be meticulously cleaned between patients.

## Conclusion

Soaking instruments in disinfectant and washing them mechanically via an instrument washer before packing and autoclaving can guarantee the utmost level of sterilization.

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