

## The Effect of Different Types of Gloves on the Setting Time of Polyvinylsiloxane (PVS) Putty Impresion Materials

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**Abstract.** The purpose of this study was to evaluate the effect of different types of gloves on the setting time of two brands of polyvinylsiloxane putty impression materials.

Seven brands of gloves (Vitex, LEG, LG, Proguard, NRL, Modern and Peha-Taft) were used for mixing two brands of polyvinylsiloxane putty impression materials (President and Reprisil). The setting times of these two putties were tested and compared to control group (mixing with washed ungloved hand). The setting times of putties were tested using a machine called "Oscillating Rheometer". The putties were mixed according to the manufacturer's recommendation and then placed under the arm of the Oscillating Rheometer to record the setting time of the putty materials. The machine was adapted to let the material set at 37°C temperature (oral temperature). After every trial the machine was cleaned well. Hands were washed thoroughly with water and dried well with paper towel. Every recording was reposted in special table. The maximum time to allow the material to set was 15 minutes (900 seconds).

The vinyl gloves tested had no effect on the setting time of President and Reprisil putties. Some brands of latex gloves caused severe retardation or complete inhibition on the setting process of the tested impression materials.

### Introduction

Infection control measures are the prime concern in every dental practice today. The routine wearing of gloves is recommended as a vital measure in prevention of nosocomial infections (Jakush, 1986; Gobetti *et al.*, 1986).

Noonan *et al.* (1985) reported that the surfaces of all viscosities of various brands of vinyl polysiloxanes that were in contact with rubber dam during setting were inhibited from polymerization. Neissen and his colleagues (1986) observed that wearing latex gloves while mixing a polyvinylsiloxane putty impression material may inhibit the setting time of the material.

Retiz and Clark (1988) found that the vinyl gloves

had no effect on the polyvinylsiloxane putties, and some brands of latex gloves caused severe retardation or complete inhibition of setting in most polyvinylsiloxane putties used in their study.

Retiz and Clark (1992) evaluated the interaction of the impression materials with washed and unwashed latex and vinyl gloves and with powdered residue left on the hands after glove removal. They found that some brands had no effect whereas other inhibited the polymerization of the impression material. Matis *et al.* (1997) found similar varying results.

The purpose of this study was to evaluate the effect of different types of gloves on the setting time of two brands of polyvinylsiloxane putty impression materials.

**Table 1. Polyvinylsiloxane (PVS) putty impression materials used in this study**

Brand Name	Manufacturer	Batch Number
President	Coltene	EF 09
Reprosil	De Trey/ Dentsply	9603172

### Material and Methods

Seven brands of gloves were used for mixing of two brands of polyvinylsiloxane putty impression materials (Tables 1 and 2). The polymerization setting times of these two putties were tested and compared to control group (mixing with washed ungloved hand). The setting times of putties were tested using a machine called "Oscillating Rheometer" (Fig. 1). This machine tested the viscosity changes in the setting material from soft to rigid consistency. Three recordings were made for each test specimen of each putty material under different conditions. The putties were mixed according to the manufacturers' recommendation and then placed under the arm of the Oscillating Rheometer. After that the chart recorder started to record the setting time of the setting material which moved with speed of 1 cm/min. The machine was adapted to let the material set at 37°C temperature (oral temperature). After every trial the machine was cleaned well. Hands were washed thoroughly with water and dried well with paper towel. Every recording was reposted in special table. The maximum time to allow the material to set was 15 minutes (900 seconds). Differences were determined to be statistically significant if the  $p$  value, using Dunnett's many-one statistics test, was  $< 0.05$ .

**Table 2. Different conditions of mixing and materials used**

Groups	Conditions	Glove Nature	Glove Description	Glove Style
Control	Hand Mixing (Washed and ungloved hand)	*****	*****	*****
1	Vinyl Gloves (Vitex®)	Synthetic Vinyl	Disposable Examination	Either Hand
2	Latex Examination Gloves - non-sterile (LEG)	Synthetic Latex	Disposable Examination	Ambidextrous
3	Latex Gloves - non-sterile (LG)	Synthetic Latex	Disposable Examination	Either Hand
4	Latex Examination Gloves (Proguard®)	Synthetic Latex	Disposable Examination	Ambidextrous
5	Natural Rubber Latex – surgical gloves (NRL)	Natural Rubber Latex	Surgical Sterile	Right and Left
6	Natural Rubber Latex- Hypoallergenic (Modern®)	Natural Rubber Latex	Surgical Sterile	Right and Left
7	Sterile Latex Gloves - Hypoallergenic (Peha-Taft®)	Natural Rubber Latex	Surgical, Sterile Hypoallergenic	Right and Left

### Results

Table 3 shows the mean and standard deviation values of two putties under different conditions of mixing and statistical analysis.

The setting time of President (PVS) putty impression material (Fig. 2) was not affected when the material mixed with washed free hand or when Vitex, LEG and Peha-Taft gloves used. There was no significant differences found between control group (washed free hand) and when use (Vites, LEG, Peha-Taft gloves) during mixing procedure. The setting time significantly delayed when LG and Proguard gloves used and significantly inhibited completely when NRL, and Modern gloves used.

The setting time of Reprosil (PVS) putty impression material (Fig. 3) was not affected when the material mixed with washed free hand or when Vitex, LEG and Peha-Taft gloves used. There was no significant differences found between control group (washed free hand) and when use (Vitex, LEG, Peha-Taft gloves) during mixing procedure. The setting time of Reprosil was significantly inhibited completely when LG, Proguard, NRL, and Modern gloves used.

### Discussion

The vinyl gloves (Vitex) tested had no effect on the setting time of either President or Reprosil polyvinylsiloxane (PVS) putty impression materials that were tested.

Two latex gloves (LEG and Peha-Taft) had no



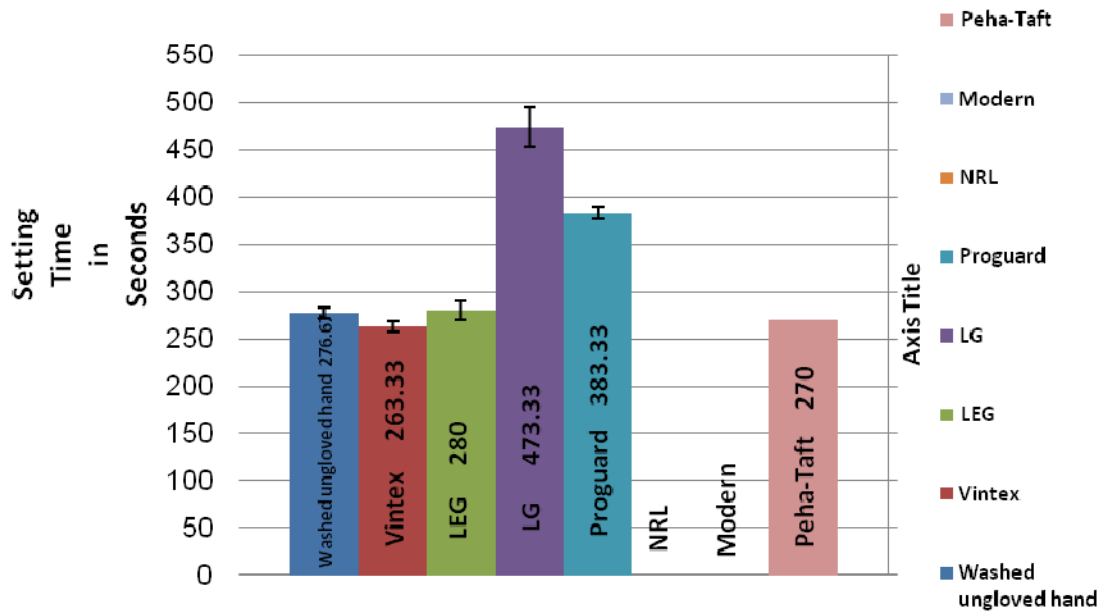


Fig. 2. Setting time of President putty impression materials under different conditions.

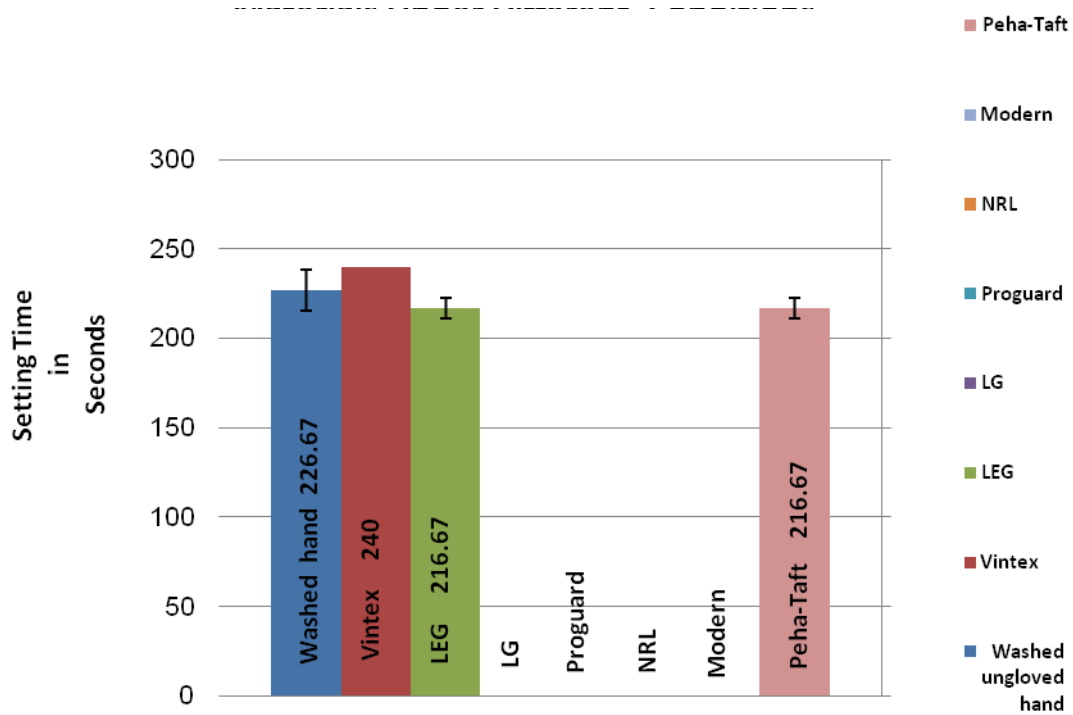


Fig. 3. Setting time of Reprisil putty impression materials under different conditions.

effect on the setting time of the two tested (PVS) putties used in this study. The setting of Reprisil putty impression material was inhibited totally when the other latex gloves (LG, Proguard, NRL, and Modern) used, while the setting time of President putty impression material was inhibited totally when (NRL and Modern latex gloves) used and delayed when the (LG and Proguard latex gloves) were used.

The inhibition of the setting time of (PVS) putties may be due to the release of sulfur-containing compound from latex gloves that may contaminate the platinum catalyst of the polyvinylsiloxane putty material (Noonan *et al.*, 1985; Matis *et al.*, 1997; Cook and Thomasz, 1986). Even the smallest amounts, as little as 0.005% of zinc diethyl dithiocarbamate (a widely used latex accelerator), are able to cause total inhibition of polyvinylsiloxane (White, 1989; Baumann, 1995).

Calcium carbonate in latex powder might be the reason of inhibition of polyvinylsiloxane (PVS) when interfering with platinum catalyst (Retiz and Clark, 1988). In addition, the powder is picking up contaminate from the latex material and cause inhibition by indirect way.

The use of gloves in dentistry is essential for proper infection control. This study has identified the gloves that caused inhibition or severely retarded of the setting time of selected polyvinylsiloxane impression putties. Finally, the authors suggest that the manufacturers of impression materials should label their products with the effect of latex gloves on the setting time.

### Conclusion

- The vinyl gloves tested had no effect on the setting time of President and Reprisil putties.
- Some brands of latex gloves caused severe retardation or complete inhibition of President and Reprisil putties.

- Latex gloves should not be worn while mixing or handling President or Reprisil.
- Sulphur compound which are the accelerators used in manufacturing the latex gloves is thought to be the causative factor of inhibition of the setting of PVS.
- Gloves powder which contains calcium carbonate is also causative factor of inhibition of setting of PVS.

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. يهدف تقييم تأثير أنواع مختلفة من القفازات الطبية على مدى تصلب صنفين من مواد مستخدمة لأخذ الطبقات والمكونة من عجينة مركبة من متعدد فينيل السيلكون. لقد تم استخدام سبعة أصناف من القفازات الطبية (فيتيكس، إل إي جي، إل جي، بروجارد، إن آر إل، مودرن، بيها-تافت) وتم لبسها على اليدين أثناء عملية خلط صنفين من العجينة المركبة من متعدد فينيل السيلكون (بريزدانت، ريبوسيل)، ومن ثم تم قياس مدى تصلب الصنفين الأنفة الذكر من العجينة المركبة باستخدام السبعة أصناف من القفازات الأنفة الذكر، ومقارنتها بالمجموعة القياسية باستخدام يدين نظيفتين ومن غير قفازات لخلط الصنفين من العجينة المركبة متعدد فينيل السيلكون الأنفة الذكر، علماً بأن جهاز (تذبذب ريوميتر) استخدم لقياس مدى تصلب المواد المذكورة تحت درجة حرارة الجسم الطبيعية ٣٧°م. بعد ذلك يُسجل الوقت في جدول مخصص لذلك مع العلم أن أقصى وقت يسمح به لتصلب المواد هو ١٥ دقيقة. ويمكن الاستنتاج من هذه الدراسة أنه عند استخدام صنف القفازات المصنوع من الفينيل لم يكن هناك أي تأثير على مدى تصلب الصنفين من العجينة المركبة من متعدد فينيل السيلكون (بريزدانت، ريبوسيل)، وبعض أصناف القفازات المصنوعة من المطاط تتسبب في تأخر حاد أو منع تام لعملية تصلب الصنفين من العجينة المركبة من متعدد فينيل السيلكون (بريزدانت، ريبوسيل).