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## Clinical evaluation of the sterilizing effect at different sampling times in the dental implants surgery using local air laminar flow system

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### ABSTRACT

**Objective:** The purpose of the study was to determine the germicidal effect in the dental implant surgery using local air laminar flow system at different sampling times. **Methods:** The air samples were collected at different time points: 10min after laminar flow system turned on, 10min, 45min after operation and 10min before operation finished. Plate exposure method was used to detect the bacteria number. The samples collected at the same time points without the local laminar flow system open were taken as the control. **Results:** When the local air laminar flow system was used, the bacterial concentration in the surgery was significantly lower ( $p < 0.05$ ). Meanwhile, the bacterial concentration in the laminar region was significantly lower than that among the peripheral region ( $p < 0.05$ ). The cleanliness at the time point of 45min after operation, in the laminar area reached the level of 10min after laminar flow system turned on. When compared with the laminar region, the bacterial concentration in peripheral areas were significantly increased both at time points of 10min after operation and 10min before operation finished ( $p < 0.05$ ). **Conclusion:** Local air laminar flow system can filter the air in the surgery, enabling the air cleanliness to reach ten thousand grade. There is close relationship between the cleaning time and the cleaning effect. To ensure the clean effect, the management of the staff and the materials should be strengthened. © 2013 Trade Science Inc. - INDIA

### KEYWORDS

Local air laminar flow system;  
Bacterial concentration.

### INTRODUCTION

Contemporarily, laminar flow is considered to be an effective way for air purification. However, high level clean surgery costs more in the daily use and mainte-

nance, with a much lower usage frequency. For example, hundred grade cleanliness surgery costs 2.2 times higher than ten thousand grade surgery, and 3.4 times higher than hundred thousand grade surgery. As most dental operations are elective, and costs less time, the cleanli-

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ness standard of ten thousand grade is appropriate for the surgery;<sup>[1]</sup>. Therefore, the present study aimed to compare the air purification effect with or without the application of local air laminar flow system and explore the relationship between the cleaning time and effect.

### MATERIALS AND METHODS

**Materials** Air sampling occurred in the same implant surgery with ceiling-mounted the local air laminar flow system (Japan, Type AC-001)<sup>[2]</sup>. Nutrient agar (Composition: peptone 10g/L, beef gelatin 3g/L, sodium chloride 5g/L, agar 20g/L) was used to collect the air samples for bacterial cultivation.

#### Methods pre-operation

The system was turned on 10min before operation for air purification, and the number of staff present was limited<sup>[3]</sup>. The surface of operation tables and surgical equipments were sterilized according to disinfection and isolation standard<sup>[4]</sup>.

#### Sample collection and location

Three and four air samples were collected in the laminar region and peripheral region respectively. Sample collection sites were located at 0.8 meter above the ground, and 0.5 meter away from the wall. The air samples were collected at different time points: 10min after laminar flow system turned on, 10min, 45min after operation and 10min before operation finished. Plate exposure method was used to detect the bacteria number. The samples collected at

the same time points without the local laminar flow system open were taken as the control.

#### Clean index<sup>[1]</sup>

Cleanliness Grade I~IV<sup>[5]</sup>

### RESULTS

As shown in TABLE 1, the average bacterium

Air Cleansing Standard	average concentration of bacterium by sedimentation(N/30min.Φ90 dish)	
	the laminar region	the peripheral region
100	0.2	0.4
1000	0.7	1.5
10 000	2	4

concentration in the laminar region was significantly lower than that in the peripheral region ( $p < 0.05$ ). The air cleanliness reached the peak at the time point of 45min after operation. Bacterial concentration rised up at two time points: 10min after operation and 10min before the end of operation both in the laminar region and the peripheral region

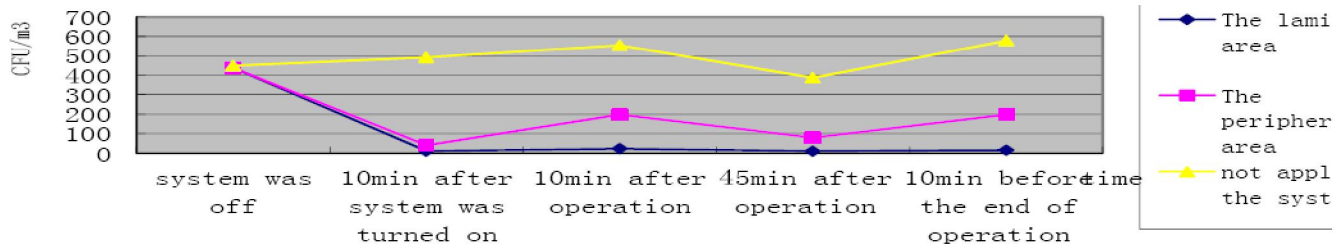
As shown in TABLE 2 and Figure 1, the concentration of bacterium was significantly higher in the implant surgery without using the local air laminar flow system, ( $P < 0.05$ ), and the average concentration was over 200cfu/m<sup>[3]</sup> which was higher than the demanded standard in a operating room. On the contrary, with the use of local air laminar flow system, the average bacterium concentration in the laminar region and the periph-

TABLE 1: Average concentration of bacterium in the air of the implant surgery with local air laminar flow system

Sample(N)	The system was on for 10min	10min after operation	45min after operation	10min before operation finished
the laminar area	20	0	0.2	0.1
the peripheral area	20	1.7	1.5	1.0

TABLE 2: Concentration of bacterium in the air of the implant surgery with local air laminar flow system turned on or off (CFU/m<sup>3</sup>)

Sample numbers	Before system turned on	System was on for 10min		10min after operation		45min after operation		10min before operation finished		
		L	P	L	P	L	P	L	P	
System turned on	20	438	10	40	23	198	10	79	15	198
Sytem turned off	20	448	491	554	386	579				



**Figure 1 : Bacterium concentration in the air of the implant surgeries with or without the use of local air laminar flow system**

eral region was less than 10cfu/m<sup>3</sup> and 200cfu/m<sup>3</sup> respectively. As demonstrated in Figure 1, the bacterium number fluctuated during the implant surgery procedure, and it reached the peak level at the time points of 10min after operation and 10min before operation finished.

## DISCUSSION

It was found that the air germ concentration in the implant surgery with local air laminar flow system off was significantly higher than that with local air laminar flow system on, and it also exceeded the standard level for a operation room. With the application of local air laminar flow system, the cleanliness of the air in the implant surgery can reach Grade ten thousand. The filtration system owns a HEPA filter in a honeycomb shape configuration and thus provide a vertical flow of clean-air [15m<sup>3</sup>/min±10%] from the filter to the operative area. This vertical flow works as a clean-air barrier that penetrates the operative area, preventing the influence of external air flows. The filtration system reaches an clarification degree of less than 0.5µm particle dust Grade ten thousand.

As shown in the curve graph, there was two peak bacteria concentration at the time spot of 10min after operation and 10min before operation finished. The current study demonstrated that the activity of the staff movement of the instruments at these moments may result in the higher numbers of bacterial, which is agreed with the previous study by Longchun Huang<sup>[6]</sup>. Accordingly, effective management of the staff reasonable work procedure decrease of the useless activity and surface disinfection of the equipment instrument and articles are vital for the infection control.

The bacteria concentration in peripheral region was higher than that in the laminar area in this present ex-

periment, indicating that we should take some effective actions in the laminar air region to decrease the infection incidence.

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