

## PC – Working Places and Conjunctival Germs

**Helga Hahn**

Fernwaerme Wien GmbH, Department of Occupational Health, Vienna, Austria.

**Abstract.** There are differences in conjunctival colonization for single or multiple used PC. After furnishing the culture medium an evaluation of germs and their antibiotic resistance was carried out. The colonization of keyboards of various germ spectrum was related to cleaning frequency and number of users. In 50% of the keyboards there was st. aureus, in 57% coag.neg.st., in 75% citrob.fr. and in 14% there was more than one kind of germs. The colonization of keyboards used by males or females differs concerning the tested germ spectrum. Personal hygiene, effectiveness and cleaning frequency of keyboards are important, since they may prevent bacterial conjunctival colonisation in PC- workers.

*Keywords.* Bacteria, Keyboards, Conjunctival sack, Gender, Personal hygiene.

### 1. Introduction

More than 10 years of work as an occupational health specialist with employees working at PCs make the question arise if any difference can be found in the spectrum of bacteria in the conjunctival sack of employees at various PC working places.

The question was: is it possible to draw conclusions from the conjunctival germ spectrum to personnel hygienics and the hygienic status of the mouse and keyboard.

Different working places were investigated:

- keyboard and mouse used by only one employee
- keyboard and mouse used by several employees.

Questions taken into consideration included demographics as well as problems with eye infections.

Personal information included: Age, Gender, Number of years working with PC, Use if lenses or glasses, Use of eye make up.

Of particular interest was to record eye problems in the anamnesis within the last 5 years. If there were eye problems, the following information was also obtained:

- How often (once or several times)
- Sicca syndrome
- Conjunctival infections (unspecific, bacterial or viral )
- Frequency of grips to the eyes
- Dermal infections on hands or any other part of the body.

Information about PC usage was also obtained:

- Period of time the present keyboard had been used )

- Frequency of keyboard cleaning
- Number of employees working at the PC

### 2. Method

Samples were taken from the conjunctival sacks of every employee as well as from the mouse, the enter key , the e-key and return key of the keyboard.

The samples were taken using cotton pads wetted with NaCl (sodium chloride). The culture medium was furnished within 3 hours.

A qualitative and quantitative evaluation of germs with specialisation concerning

- Staphylococcus aureus
- Coagulase negative staphylococcus and
- Citrobacter freundii

and resistance screening concerning

- penicillines
- tetracyclines, or
- other types of medication was carried out.

Employees were anonymous classified, and so were the working places. There was no control group.

### 3. Objectives

The objectives taken into consideration where the following:

- If there are differences in conjunctival colonization if the PC is used by one or by several employees;
- If the number of working years at the PC is correlated with the frequency of conjunctival colonization;

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- If the touching the eyes can make any difference in the germ colonization;
- If there are differences in the germ spectrum between males and females;
- If differences can be found in people wearing glasses or contact lenses as compared to those who do not wear glasses or contact lenses;
- If personnel hygienics is a relevant factor;
- If the frequency of keyboard cleaning is a relevant factor;
- If dermal infections are of any interest.

#### 4. Results

Fifty users, 17 women and 42 men, participated in the study. Hence there were 28.8% females and 71.2% males. They worked at 28 different PCs. The average age was about 35 years of age. 10% of the test persons used lenses, 29% glasses and 64 % neither lenses nor glasses. 54% of the females had worked 5 – 15 years at the computer, whereas 64 % of the male employees had spent 5 – 15 years at the PC.

Although the relative number of males and females were different as well as the amount of computer usage, there was no obvious difference in the amount of visual problems (24 % women and 21% men ).

However there was a striking difference in the frequency of conjunctival colonization in relation to the number of working years at the computer; 35% of those working < 5 years, 28% of those working 5 – 15 years, and 67% of those working > 15 years at the computer showed conjunctival colonisation of at least one of the germs tested. No difference in the germ spectrum could be found.

Even though the tendency that there is a slightly larger group of women having been working at the computer for more than 15 years (12% females and 7% of males), the finding seems to be of some interest.

Highly interesting is the fact that of those men and women suffering from any eye problem, none has suffered only once, but several times from the same problem (69%), or from different kinds of troubles such as Sicca Syndrom (46%) or bacterial or unspecific infections (61%).

In this context, it seems as if females grip more frequently to the eye (42 % > 20 times a day) than men (12% > 20 times a day ), or another point of view - women have a better memory of how often they grip.

71% of all female participants wear eye make up. Two-thirds of those work at a single user computer, one-third at a shared PC. If one relates eye make up to conjunctival infections and at the same time working at a colonized computer, one could assume that women wearing eye make up do not grip as often to the eye than those without. However, one must take into consideration that this study is a small one.

Considering the frequency of conjunctival germs when working at a single or a shared computer, we find different situations in women and men. In 47% of females we found conjunctival germs, 62.5 % of those working at a single, and 37.5% working at a shared PC. The situation for men was quite different. Only in 29% of all male participants

conjunctival germs were found, whereas one third of those worked at a single user computer, while two-thirds at a shared computer.

The conjunctival germ spectrum comprised:

- Staphylococcus aureus,
- Coagulase negative staphylococcus, and
- Citrobacter freundii.

Half of the germs found were coagulase negative staphylococcus, 35 % were staphylococcus aureus, and 15 % citrobacter freundii..

However, in more than half of the men (58%) coagulase negative staphylococcus could be found, whereas female conjunctivas were colonized by staphylococcus aureus in 50% of all colonized women.

There was also a slight difference in men and women in the colonization by citrobacter freundii (12.5% females, 16.7% males).

50% of all tested keyboards were colonized. Approximately every third of the keyboards was in use for less than 1 year, 2 years and more than 3 years.

46% of the tested keyboards had never been cleaned, 36% had been cleaned once, and only 18% had been cleaned several times.

Relating colonized keyboards to the germ spectrum, frequency of cleaning - related to gender - and the number of users, we found:

- 50 % had staphylococcus aureus,
- 57% had coagulase negative staphylococcus,
- 7 % had citrobacter freundii, and
- 14 % had several of those mentioned before.

Half of the female participants cleaned the keyboard once when working at a single user PC, whereas 42 % of the males cleaned several times when using a shared computer;

There seems to be a tendency that the colonisation of the computer is of interest in frequency of colonization of users (71% of male participants with conjunctival germs work at a colonized computer). Because of the small sample of women there was no clear tendency for women.

All the tested germs were resistant against penicillines, most of them were sensitive to tetracyclines, makrolides, aminoglycosides or sulfonamides. In the end one should choose the antibiotic according to the antibiogramme.

#### 5. Conclusion

Most of the employees were between the age 30 and 40 years. There was only little difference between men and women in the total amount of eye problems (not included: visual disorders). But there is a striking difference in the frequency of conjunctival colonisation related to the number of working years at the computer. The greater the number of years, the greater the incidence of conjunctival germs (83% of those working > 15 years).

When suffering from eye problems, men and women alike mostly suffer from the same or from different troubles such as sicca syndrome or bacterial or other infections. Females seem to touch their eyes more often than men. The colonisation of the keyboard of males and females Because of

the limited number of participants, no clear tendency in workers with or without glasses or lenses could be seen. Furthermore no tendency could be found concerning dermal infections and the colonisation of the keyboard.

There are differences in behaviour between men and women, such as women clean their keyboard less frequently but more efficiently than men. Women tend to be colonized differs relating to the spectrum of germs, which makes us assume that women take care of their personal hygiene more effectively than men.

## **6. Summary**

Personal hygiene, such as washing the hands, effective cleaning of keyboards and the cleaning frequency of keyboards are important factors since they affect the bacterial conjunctival colonisation in employees working at personal computers. When suffering from serious conjunctival infections, samples should be taken and treatment should be according to the anti-biogramme.