Asepsis in dental office

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Every medical or dental office is potentially a space where agents of infection can be easily **transmitted to others. It is called: Cross-Contamination.**
Everyday health professionals (doctors, dentists, surgeons, nurses, ophthalmologists, etc) are confronted with these risks of Cross-Contamination coming from patients (patients already infected by pathogenic germs, or also from medical staff).
Problems **of Cross-Contamination must not be minimized nor exaggerated, but in our case, dentists should be aware of these problems in their office, *not only* for themselves but also for their patients and staff as well.**

Patients

As usual patients enter the waiting room, without taking special precautions, bringing germs with them from the outside, on their shoes. Most of these germs are present by billions in the streets, excrement from animals, spit, severe pollution, etc.) Most of the time the waiting period in the waiting room is quite long for the patients and we have to keep in mind the physical phenomena called *"thermophoresis"*.

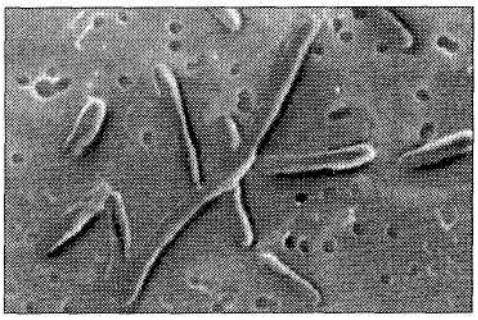
The body heat is sufficient to allow the rise of small and light particles of 30 to 40 microns towards the ceiling. That is called thermophoresis.

Knowing that the normal cutaneous surface of a human body is around 1,75 m^2, with at least 100 million germs on this surface, and that one scale (small particle of skin) is around 15 microns in size, it is easy to understand that some bacteria which do not exceed the size of 0,2 microns will be easily dispersed in the atmosphere, *settling over all surfaces.*

Figure 1. Waiting room

The temperature inside the waiting room is often too high, and we know that this fact (warmth) is one of the main factors for the development of infecting germs. Quite often, professional offices are air-conditioned which is also an excellent vector in the case of pathogenic germs. All biologists remember the deadly epidemic of the *legionella* in July 1976 in the USA, where close to 200 veterans died after a friendly reunion in a hotel in Philadelphia. This epidemic was transmitted through the hotel air conditioning outlets *{Figure* 2).

Figure 2. Legionella pneumophila



The same problems happened in Turkey in 1997 (2 people died) as well as in France (Tarbes in 1998) during the football World Cup in 1998, in the European parliament in Strasbourg in July 2000, and lately, in the new hospital G. Pompidou in Paris in 2001 and in many other countries, but governmental health agencies do not like to mention these problems, because of the media.

In the waiting rooms, patients are close to each other, and some of these patients are not always at their best, as far as hygiene is concerned. A study made recently in Switzerland proves that

the simple fact of washing hands can cut by 60% the number of nosocomial infections contracted in hospitals (in France, 10 000 dead per year).

The main contamination is *hand-carried,* and could be easily treated and eliminated through normal washing procedures.

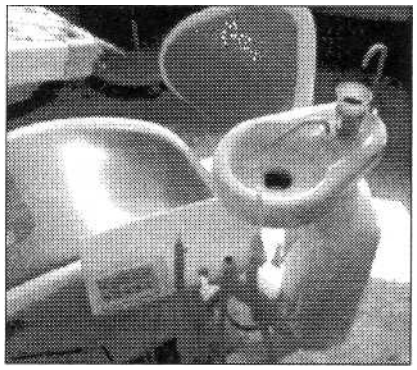
In case of congestion of the lungs, with coughing and sneezing, sneezing produces about 60 000 splutters which are projected to a distance of 5 to 6 meters.

Also 1 mL of nasal secretions contains 10 million aerobic bacteria and 100 million anaerobic bacteria.

Let's not forget the "sprays" can carry microscopic drops of liquid in the air, which is also an excellent vector to transmit germs.

In these conditions, we can easily imagine that microorganisms brought in, by patients will automatically contaminate all the surrounding surfaces inside the waiting room as well the dentist's office and dental equipment *(Figure 3).*

Figure 3. Dental equipment



If the room is equipped with a false ceiling, the risks will even be greater, because of difficulties of cleaning the room.

It is well established that medical waiting rooms (doctors and patients) and because of the numbers of patients going through everyday, have, at the end of the day, a contamination level that could be a risk for other patients the next day, as well as for the entire medical staff. In the present climate of serious fears about the spread of nosocomial infection between hospitals and patients and with the long-standing problems of hepatitis B cross-infection there is a strong need for a better decontamination system. The professor Boyan Christophorov form the hospital Cochin in Paris confirms an upsurge of tuberculosis in Europe, with 4000 cases in France, of which 1000 cases in the Paris area only.

Despite medical information known by the doctor about his patients, it is not always possible to know if patients are carrying pathogenic agents without showing any clinical signs.

Reasons for this situation:

- The patients are in phase of incubation of infection;
- The patients do not know their personal medical situation.

For example, 50% of patients carrying hepatitis B do not know their real medical state and only 52% of HIV carriers have informed their dentists about this fact. We also know that globally speaking the immunitary defenses of patients are weaker than 30 years ago.

Facts

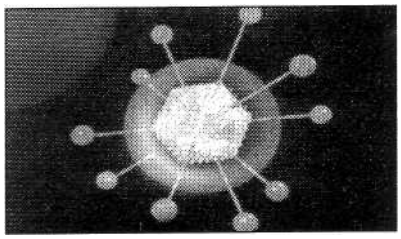
The dentists are right in the middle of this cross-contamination situation.
Patients.. .Dentists.. .Patients.. .Patients.. .Staff.. .D entists...

It is well known that the rate of Hepatitis B, Heipes simplex, cold is statistically higher among dentists than the "normal" population.

If we look over some of the infecting agents found in dentistry, especially one transmitted through the air, we find that some of these agents are quite dangerous.

- cytomegalovirus
- measles, mumps
- influenza, rhinovirus
- adenovirus *(Figure 4)*
- rubella (German measles)
- *Mycobacterium tuberculosis*
- *Streptococcus pyogenic* as well as
- *Staphylococcus aureus,* and other dan gerous infecting agents.

Figure 4. Adenovirus



Cross-contamination is carried by:
- direct contact with mucous, saliva, blood,

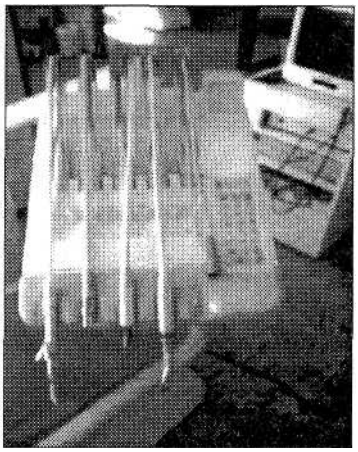
-.microscopic drops containing infecting agents.

Even if dentists wear gloves, masks, and protecting glasses, they are not immune to contamination because some of these infecting agents will settle on surfaces surrounding the dentists, to develop later on, as pathogenic colonies that will "wait" for a "carrier".

Means of transmission

- dental high speed turbine (350 000 T/mm);
- ultrasonic scales *(Figure* 5);
- dry air, used to dry the tooth during clinical work.

Figure 5. Ultrasonic scales



All these apparatus help to mix together water, saliva, air, blood and infecting agents, which will automatically create some "droplets nuclei" increasing the level of micro-organisms in the air.

Avoiding cross-contamination by invading bacteria is, of course, still an important aspect of disinfecting management, and there has been an increasing awareness of this major problem.

It is widely recognized by medical authorities around the world that *prevention* is certainly the best "Barrier" against bacterial invasion.

Preliminary results of a controlled study in the management of air contamination indicates that the use of a daily disinfecting concept, such as ASEPTOFLUX, can decrease rapidly and efficiently the risks of cross-contamination.

ASEPTOFLUX

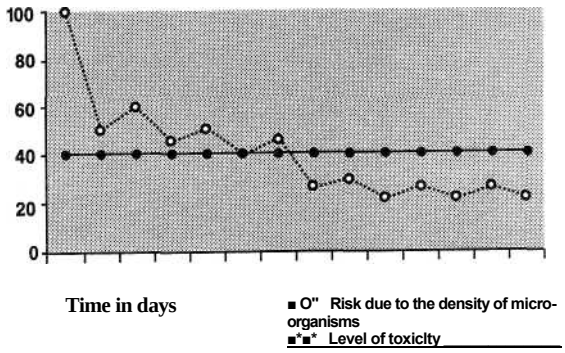
As part of an efficient infection control system, disinfecting must be:
- simple.. .fast.. .ecological...
- automatic.. .cost effective...
- reliable...and...proven….

The new ASEPTOFLUX concept is a specially designed ultrasonic turbine that sucks in most of the air in the room, which is, then atomized and returned as a non-wetting disinfectant spray of micro-particles. Lightly scented, this "microscopic spray" deodorizes and purifies the ambient air.

The novelty in this new concept is that it leaves no moisture to be wiped up afterwards and treats even the most inaccessible areas and surfaces.

Another important feature, in addition to its disinfectant power is, its observed effectiveness against mites, a common cause of allergy.

Figure 6. Principle of reduction of risk (Daily usage)



The Second Series of Investigations

Various means exist today and are available to us for sterilizing periooperative atmospheres by decontamination of the ambient air.

We chose two of those systems and put them through a series of measurements, similar to those made previously, sampling the ambient air before and after treatment. Out intent not being to advertise any particular system, we will not give brand names. These systems function by spraying the volume occupied by the operational facilities with substances designed to eliminate all microbial agents, not only in the air, but also on working or other surfaces, on which those substances subsequently settle.

The characteristics of sprayed product must fulfill certain criteria:

- it must not be corrosive;
- it must not be volatile;
- it must not be toxic;
- it must not be irritating;
- it must have as broad a spectrum of action as possible;
- it must be biodegradable;
- it must be stable over time;
- it must comply with AFNOR requirements regarding effectiveness;
- it must be reasonable in cost.

Effectiveness

A product is described as a disinfectant if it is capable of reducing by 5 log the population of reference bacterial strains within a given lapse of time. As an example, a 5-minute treatment can reduce a population of 100 million microorganisms to less than 1000 germs per milliliter. While these figures seem enormous, it should be pointed out that a microorganism produces 100 million offspring in only 12 hours under the right conditions. Yet those are fairly close to the conditions commonly required for our comfort, in temperature, hygrometry and pressure.

Experimentation and Results with the First Airborne Disinfecting System

Equipment: Atomizer

The device is a spray atomizer operating at 22000 rpm, which saturates the ambient air by throwing a jet of tiny particles (roughly 10 microns in diameter) over a distance of more than 20 meters. This spray impregnates all surrounding surfaces with a non-wetting 5 micron-thick film. The device may be programmed to operate off-hours, thanks to a timer and particle-density settings - indispensable features well worth mentioning.

Product sprayed: DLS Pharma 50 (Aseptosyl)

Its advertised originality is that it contains no aldehyde, chorine or phenols. Its principles are stabilized peroxides to which are added quaternary ammonium synergists.

Its characteristics are those already mentioned. In other words, it is a bactericide, virucide and fungicide. It is active in the presence of biofilms, those semi-permeable mucopolysaccharides secreted by bacteria to protect themselves from outside aggression. It complies with AFNOR standards EN 1040 and EN 1475.

Application of the concept

Our procedure consisted of taking samples from surfaces and from the matter filtered out of 500 liters of air, in exactly the same manner as in the preceding investigations and the same locations.

Before 8:30 a.m., we proceed with room and equipment maintenance, throughout all the offices and in the sterilization area, without changing the establishment's routine procedures. At 9 a.m., a first series of samples are taken, identified by the letter "A" following the usual number that identifies the location.

After completion of the sampling, we then proceed to spray the tested product for 17 minutes (time calculated on the volumes to be treated).

At 10 a.m., a second series of samples is taken, identified by the letter "B" following the same numbers marking the same locations. (The implant interventions begin at 10 a.m. every weekday).

We repeated this routine eight times between April 22, 1998 and May 5, 1998. The eight sets of results show a very appreciable improvement in the level of asepsis in the facility as a whole. In this article, we have only published the reports for April 22, 28 and 30, but others are all very similar. The numbers of colonies capable of growth are 3 to 200 times lower in the samples labeled "B" than in those labeled "A". On April 30th, for example, we registered a decrease in the surgery room from stage 190 to a stage of less than 2; the ratio in the sterilization area on the same date was about the same, and very comparable results were found on the 22nd and the 28th.

We then set out to conduct the same series of tests with the addition of a "C" sample taken at the end of the interventions. Obviously, the patients operated on those specific dates did not feel any healthier than those operated previously, but the ability to offer higher quality conditions while maintaining the usual degree of comfort is a source of satisfaction, not to mention the advantage of a treatment that operates automatically and does not overrun the budget and allocations generally earmarked for asepsis.

REPORT No. 98/A21

- Date: 04/24/1998
- Samples furnished:
  4 boxes Ø 55 ISOBIO contact
  2 boxes Ø 55 PCA
  Receiving by the laboratory on 04/22/98
- Processing:
  Incubation of the boxes at 30°C
  Colony count
- Results

SURFACE SAMPLES

Sample reference	Number of microorganisms collected / 25 cm^3
2A	10
2B	≈70 (cluster)
3A	>150 (film)
3B	8

AIR SAMPLES(volume taken from 500 l)

Sample reference	Number of microorganisms collected / m^3
1A	≈441
1B	<2

Laurent Guichard
Mngr Development/Quality

REPORT No. 98/A24

- Date: 04/29/1998
- Samples furnished:
  4 boxes Ø 55 ISOBIO contact
  2 boxes Ø 55 PCA
  Receiving by the laboratory on 04/28/98
- Processing:
  Incubation of the boxes at 30°C
  Colony count
- Results

SURFACE SAMPLES

Sample reference	Number of microorganisms collected / 25 cm^3
2A	100
2B	24
3A	12
3B	5

AIR SAMPLES(volume taken from 500 l)

Sample reference	Number of microorganisms collected / m^3
1A	190
1B	<2

Laurent Guichard
Mngr Development/Quality

REPORT No. 98/A27

- Date: 05/205/1998
- Samples furnished:
  4 boxes Ø 55 ISOBIO contact
  Receiving by the laboratory on 05/04/98 (samples taken on 04/30/98)
- Processing:
  Incubation of the boxes at 30°C
  Colony count

Results

AIR SAMPLES (volume taken from 500 l)

Sample reference	Number of microorganisms collec ted / m^3
1A	190
1B	<2
2A	251
2B	<2

Laurent Guichard
Mngr Development/Quality

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