

Dental practice

# Infection prevention in dental practice

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# Introduction

The guideline *The Prevention of Infection in Dental Practice* is a revision of the guideline on practical hygiene in dental practice that was published in 1995, which has now been superseded. The recommendations set out in this guideline are intended for dentists and practice employees. The recommendations are based on a careful analysis of the literature, the expertise of the members of the subcommittee which drew up the guideline and the members of the Dutch Working Party on Infection Prevention, and national observations.

## 1 Personal hygiene

Good personal hygiene contributes to the prevention of infection in dental practice and also protects employees themselves against infections.

### 1.1 Nails

- ☞ Nails should be cut short and be clean<sup>1</sup>.
- ☞ Nail varnish should be intact, i.e. no chips or flakes.
- ☞ Artificial nails are not permitted.  
Artificial nails can be a source of contamination [1,2].

### 1.2 Hair

- ☞ Hair should be clean.
- ☞ Long hair should be worn tied up or tied back.

### 1.3 Beards and moustaches

- ☞ Beards and moustaches should be well cared for and cut short.

### 1.4 Jewellery

- ☞ No rings, bracelets or wristwatches should be worn during work.  
It is not possible to wash hands and/or lower arms if these are covered in jewellery [3-5].
- ☞ Piercings are regarded as jewellery. If a piercing hampers the treatment/care of a patient, it should be removed [6].

### 1.5 Use of handkerchiefs

- ☞ Paper handkerchiefs should be used during work.
- ☞ After use handkerchiefs should be immediately thrown away and hands should be washed or disinfected.

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<sup>1</sup>The sign in the margin (“a little hand”) means that this is a recommendation, i.e. a preferred measure recommended by the Working Group.

Used handkerchiefs that are carried in trouser pockets or elsewhere in clothing can act as a source of contamination and contaminate the hands every time that they are touched.

## 1.6 Eating, drinking and smoking

- ☞ In critical and semi-critical areas no eating, drinking or smoking is permitted.  
See Section 9.2 for the terms critical and semi-critical areas.

## 1.7 Clothing

- ☞ During the treatment of patients and the handling of used instruments clothing with short sleeves should be worn in order to make good hand hygiene possible.
- ☞ This clothing should be changed daily and in the case of visible contamination immediately.
- ☞ During treatment clothing should not be touched with the hands (gloves).

# 2 Infections

A dentist or an employee with an infection, for example a bronchial infection or diarrhoea or is a carrier of pathogenic micro-organisms, may be a source of contamination for patients and colleagues. Sometimes they should refrain from treating patients and should avoid contact with patients who are extra-sensitive to infections, such as patients who are being given immunosuppressants. If there is any doubt, it is a good idea to ask the advice of a doctor.

# 3 Immunisation

- ☞ All dentists and all the practice employees should be vaccinated against hepatitis B because of the risk of exposure to blood and the possible risks this causes.

Immunity to hepatitis B should be checked a month after the last injection. People who have not been vaccinated are subject to the guideline 'Preventive iatrogenic hepatitis B' [7].

- ☞ A policy should be pursued relating to the vaccination status of employees for hepatitis B, polio, rubella and whooping cough and the registration of these in accordance with the national vaccination programme and the policy of the Commission for the Prevention of Iatrogenic Hepatitis B.

# 4 Hand hygiene

## 4.1 Introduction

The skin is composed of various layers, with microorganisms in the upper layers. The micro-organisms present can be roughly separated into:

- resident micro-organisms, or permanent flora and
- transient micro-organisms, or temporary flora.

The resident flora include the micro-organisms that are present in the deeper skin layers. These micro-organisms are virtually impossible to remove from the deeper skin layers. In general, resident micro-organisms are hardly pathogenic (a cause of illness).

The transient flora include the micro-organisms that are on top of the skin and that have got there through contact with other people or with objects, etc. These micro-organisms are called transient because they can be easily removed by washing the hands with soap and water.

The hands are a major source of contamination. The effectiveness of good hand hygiene has been demonstrated for the prevention of infection [8,9]. There is a difference between hand-washing using soap and water and rubbing hand alcohol into the hands [10]. Hand washing and rubbing the hands with hand alcohol are regarded as the most important measure for reducing the risk of the transfer of microorganisms from one person to another or from one body part to another.

Hand alcohol is the collective name for the alcohol preparations that are used for non-preoperative hand-disinfection and it can be based on either ethanol or isopropanol. The addition of chlorohexidine or another disinfectant does not contribute to the immediate germicidal effect that alcohols already have [11]; however, this does have a longer-lasting effect [12]. In view of the usual duration of dental interventions (less than two hours) this effect is not necessary.

N.B. The use of disinfectant soap or chlorohexidine scrub is not useful for the same reason.

N.B. The frequent use of soap (over 10 x a day) when replacing gloves between patients has dermatological disadvantages. For this reason too hand alcohol is recommended.

## 4.2 Hand washing or disinfecting?

For hand hygiene a choice can be made between washing the hands with soap and water and rubbing hand alcohol into them. The advantage of using hand alcohol compared with washing the hands with soap and water is that it costs less and is less harmful to the hands.

☞ If the hands are visibly contaminated, they should always be washed with water and normal liquid soap.

Hand alcohol does not clean the hands.

## 4.3 Hand washing or disinfection methods

### 4.3.1 Water tap

☞ The water tap should not be touched with the hands and should therefore have an elbow control, foot control or infrared sensor.

### 4.3.2 Dispensers

☞ Soap and hand alcohol dispensers should be designed in such a manner that they can be operated using the elbow and, when used, the hands cannot contaminate the soap in the nozzle.

☞ Dispensers should have a disposable reservoir that cannot be refilled. The entire bottle should be replaced when the dispenser is empty.

☞ The dispenser should be cleaned when the reservoir is replaced.

### **4.3.3 Wounds**

- ☞ Open wounds on the hands or skin lesions should be covered with a waterproof plaster, even if gloves are worn.

### **4.3.4 Drying**

- ☞ Disposable paper towels should be used for drying the hands.

### **4.3.5 Creams**

If the hands are washed, it is important that a fairly rich hand cream is used from a tube or dispenser so that the hands remain unblemished despite the frequent washing.

- ☞ Creams should be used from small tubes or from dispensers with disposable containers that are not refilled.

The use of a cream helps to prevent the drying-out of the skin.

### **4.3.6 Technique for hand washing**

1. Wet the hands with water from a fast-running tap and cover them with a layer of liquid soap from a dispenser without touching the tap or the dispenser.
2. Rub the hands together vigorously for 10 seconds; the soap should be rubbed well into the fingertips, the thumbs, the areas between the fingers and the wrists.
3. Rinse the hands well.
4. Turn off the tap as indicated in section 4.3.1.
5. Dry the hands with a disposable towel, including the wrists and the skin between the fingers.
6. Throw the used towel into the waste bin intended for this purpose.

### **4.3.7 Technique for rubbing hand alcohol into hands**

1. Apply the hand alcohol from the dispenser to the dry hands without touching the dispenser's nozzle.
2. Take sufficient hand alcohol to fill the hollow of one hand [1].
3. Carefully rub the hands together for around 30 seconds until they are dry. The hand alcohol should also be rubbed well into the fingertips, the thumbs, the areas between the fingers and the wrists.

N.B. Certain parts of the hands are often forgotten. Frequently forgotten parts of the hands are the fingertips, between the fingers and the thumbs.

## **4.4 Indications for hand washing / disinfection**

- ☞ Hands should always be washed or be rubbed with hand alcohol:
  - before and after each patient;
  - after blowing one's nose;
  - after coughing and sneezing;
  - after a visit to the toilet;
  - before handling equipment that is ready for use;
  - after handling used equipment.

## 5 Personal protective equipment

### 5.1 Gloves

Wearing gloves:

- prevents hands coming into contact with blood, saliva and mucous membranes. This is important because of the risk of contamination of the dentist or the employee.
- reduces the risk of micro-organisms being transferred from one patient to another via the dentist's or employee's hands.

#### 5.1.1 Non-sterile gloves

- ☞ Gloves should always be worn when the hands come or could come into contact with blood, saliva, mucous membranes or with treatment materials and contaminated equipment that has been in contact with these.

Gloves should be removed immediately after these treatments. They should not come into contact with clothing and equipment in the surrounding area such as telephones, door handles, instruments, keyboards, etc.

- ☞ New gloves should be worn for each patient.

Working without gloves is only allowed when using a “no touch” technique.

- ☞ Immediately after the gloves are removed they should be put into the waste and the hands should be washed using soap and water or be rubbed with hand alcohol.

Wearing gloves is not an alternative to hand-washing or disinfection. Refer to the WIP guideline: *Personal protective equipment*.

- ☞ Approved gloves meet the prescribed standards that are shown on the packaging. In The Netherlands this is the standard for gloves that provide protection against chemicals and micro-organisms (EN 455-1/2/3).

Latex gloves may contain substances that cause strong allergic reactions in people who are sensitive to them [13]. In this case latex-free gloves should be used. This applies to all employees at the practice.

- ☞ Washing or disinfecting gloves (using hand alcohol) between patient treatments is not permitted.

Gloves can “break down”, which means that they let moisture through small, unnoticed holes. Moreover, the quality of the gloves can significantly deteriorate because of the effect of disinfectants, oils and lotions [14].

- ☞ If the gloves are damaged during treatment by needles or other sharp objects, new gloves should be put on.

#### 5.1.2 Sterile gloves

- ☞ If sterile surgical interventions are carried out, the gloves worn should be sterile.

A sterile intervention is when there is contact with sterile tissue and bone is exposed. Examples are the removal of impacted elements and the preparation and placing of implants and apex resections (see Section 10, Surgical Interventions).

- ☞ Before sterile gloves are put on, hand alcohol should be rubbed into the hands.

- ☞ If gloves are damaged during treatment by needles or other sharp objects, new gloves should be put on.

### 5.1.3 Rubber gloves

- ☞ Sturdy gloves should be worn when cleaning equipment.

## 5.2 Eye protection

The purpose of eye protection is to protect the wearer against airway secretions or splashes and squirts of blood or other bodily fluids, secretions or excretions.

There are three ways to protect the eyes:

- Protective glasses

Normal glasses cannot serve as protective glasses because in the case of splashes or squirts the head turns away on a reflex and the sides of normal glasses do not offer any protection.

- Face shield
- Mask with splash shield.

- ☞ Eye protection should be worn for treating every patient where there is a risk of splashes or aerosols of blood, saliva or rinse water and when handling soiled equipment.

- ☞ The reusable eye protection should be cleaned and then disinfected with 70% alcohol after every treatment that involves contamination.

## 5.3 Mask

- ☞ A surgical mask should be worn for treating every patient where there is a risk of splashes or aerosols of blood, saliva or rinse water and when handling contaminated equipment.

- ☞ A new mask should be used for every patient. This also applies if the mouth/nose mask gets wet.

A normal surgical mask can provide the protection. This mask provides protection against splashes but does not provide protection against the breathing in of small droplets.

The circumstances under which the use of eye protection and a mask should be used are the same; they should therefore always be worn together.

## 6 Accidental contact with blood

Accidental contact with blood means exposure to blood or to bodily fluids that have been visibly contaminated with blood by a percutaneous wound or through contact with mucous membrane or broken skin [15].

Accidental contact with blood as a result of puncture/cut accidents occurs mainly in the following situations:

- while cleaning sharp equipment (over half of cases),
- while carrying out interventions (around 40% of cases),
- while administering a local anaesthetic,
- while returning a needle to a sleeve.

In addition, a prick accident can occur when placing an unprotected used needle in a needle container. People can also prick themselves on unprotected needles.

Accidental contact with blood will occur more often in situations of high work pressure and in particular in critical situations.

## 6.1 Prevention of accidental contact with blood

- ☞ First and foremost work should be carried out as tidily and as orderly as possible.
- ☞ Equipment should be cleaned by machine instead of by hand.
- ☞ Gloves should be worn during the administration of anaesthetic.
- ☞ Needles should not be bent, broken or otherwise manipulated.
- ☞ Needles should not be guided using the fingers.
- ☞ The disposable needle used for (re)anaesthetising a patient should be placed back into the sleeve using one hand only.
- ☞ The needles should be placed in a needle container after use.
- ☞ The needle containers should meet the set requirements [16].

The containers are made of hard plastic and have a device that makes it possible to separate the needle from the syringe or the needle holder without touching the needles with the hands. The needle containers should close in such a way that they cannot open spontaneously and cannot be reopened. It should not be possible to puncture the containers with needles and the containers should be leak-proof [16].

- ☞ Needle containers should be regularly replaced.

The needle containers should not be overfilled. Therefore they should not be filled above the line indicated on every needle container.

- ☞ For the handling of used equipment gloves should be worn that protect against pricks and cuts.

## 6.2 Procedure following accidental contact with blood

- ☞ Following accidental contact with blood let the wound continue to bleed and rinse the wound (using water or physiological salt). Then disinfect the wound using a skin disinfectant.

In the case of contamination of the mucous membranes rinse immediately and as well as possible with water or physiological salt. This water or physiological salt should not be swallowed.

- ☞ Every dental practice should make arrangements about the further treatment of accidental contact with blood. This can be done in various ways, for example via the Occupational Health & Safety Inspectorate or the GGD (Municipal Health Service).

Extended policy on accidental contact with blood is set out in the national guideline: Accidental puncturing [15].

## 7 Cleaning, disinfection and sterilisation

### 7.1 Definitions

#### 7.1.1 Cleaning

Cleaning is the removal of visible dirt and visible and invisible organic material in order to prevent micro-organisms being able to remain, multiply and spread.

#### 7.1.2 Disinfection

(Thermal or chemical) disinfection is the reduction in the number of micro-organisms (bacteria, mould or viruses) on lifeless surfaces and on intact skin and mucous membranes to a level that is regarded as acceptable.

#### 7.1.3 Sterilisation

A process that kills or deactivates all the micro-organisms on or in an object in such a way that the risk of the presence of living organisms per sterilised unit is smaller than one in a million.

### 7.2 Disinfecting or sterilising equipment?

There are three distinct categories with regard to the treatment of equipment in order to make it suitable for reuse: critical, semi-critical and non-critical use. The table below sets out the application of these categories and the method of decontamination.

Table 1: Treatment of equipment to be reused

<b>CATEGORY:</b>	<b>INSTRUMENT IS USED FOR:</b>	<b>DECONTAMINATION METHOD</b>
<b>Category A: critical use</b>	Invasive interventions in which there is contact with sterile tissue.	Cleaning and packaged sterilisation.
<b>Category B: semi-critical use</b>	Interventions with demonstrable risks as a result of the transfer of micro-organisms, such as check-ups, removal of plaque, curetting, dentures, extractions and root-canal work.	Cleaning and thermal disinfection or unpackaged sterilisation.
<b>Category C: non-critical use</b>	Interventions in which the risk of transfer is very small, such as orthodontic work, prosthesis work, fluoride treatment and the taking of X-rays.	Cleaning and thermal disinfection. (Use chemical disinfection if equipment is not resistant to thermal disinfection.)

## 7.3 Disinfection

Disinfection should be limited to situations in which sterility is not required but in which cleaning alone does not sufficiently reduce the level of contamination. If disinfection is necessary, thermal disinfection is preferred. Thermal disinfection is carried out using water at a temperature of 65 - 100°C or using steam. Refer also to the WIP guideline: *Policy on cleaning, disinfection and sterilisation*. For surfaces and objects that are not resistant to high temperatures chemical disinfection should be chosen. Cleaning should always precede thermal and chemical disinfection. The instrument washing machines combine machine cleaning and thermal disinfection.

The following remarks are important for the correct application of disinfection:

- before disinfection always clean well first
- use chemical disinfection only in situations set out in the guideline
- use only legally permitted disinfectants (see below)
- dilute and dose in accordance with statutory instructions as stated on the instruction leaflet or the label.

### 7.3.1 Disinfectants

There are four laws in The Netherlands that govern the use of disinfectants in a medical environment, depending on the application area of the disinfectant. These are: the Medicines Act, the Medical Appliances Decree, the Pesticide Act and the Commodities Act. Disinfectants that are permitted within the framework of the first three acts referred to above can be recognised by their RvG number, CE marking and N number of the Board for the Authorisation of Pesticides.

The following disinfectants are eligible for use in dental practice:

- *Alcohol*

Alcohol is used for disinfecting skin and hands. Refer to the WIP guideline: *Hand hygiene*.

70% alcohol without any additives is used for disinfecting small surfaces and objects.

Duration: wet the surface well and leave to dry in the air; in the case of immersion leave for 10 minutes.

- *Chlorine preparations*

250 ppm of chlorine can also be used for surface disinfection.

For surfaces that have been contaminated with blood or other bodily fluids a 1,000 ppm of chlorine solution is used (250 ppm = 0.025% and 1,000 ppm = 0.1% of free chlorine).

Duration: wet the surfaces well and leave to dry in the air.

- *Peroxides*

Hydrogen peroxide, peracetic acid and sodium perborate are used. Peracetic acid is permitted as an instrument disinfectant and sodium perborate as a disinfecting storage fluid in case cleaning is delayed for some time. Peroxides are corrosive for a lot of materials including non-anodized aluminium, brass, rubber and textile.

## 7.4 Sterilisation

- ☞ Sterilisation is required for critical equipment, substances, etc. that come into direct contact with sterile tissues or organs.

The sterilisation of equipment that is intended for reuse takes place in a steam steriliser.

### 7.4.1 Steam sterilisers (autoclaves)

- ☞ The steam steriliser should be suitable for the intended use.

The supplier should be asked if the equipment provided is suitable for the instruments likely to be sterilised.

Steam sterilisers (autoclaves) can be bought in various sizes and types. Particularly important for the steam-sterilisation process is the removal of air from the steam steriliser, hollow instruments and packaging; as well as the drying of sterilised products. These processes are described in sections 7.4.1.1 and 7.4.1.2.

#### 7.4.1.1 Removal of air from steam steriliser, hollow instruments and packaging

The presence of air obstructs the sterilisation process. The following principles are mostly used to remove the air from the steam steriliser.

- Removal of air through displacement with steam  
This principle is used in simple autoclaves and pressure-cookers. Steam is produced in the steam steriliser room by boiling water; the pressure in the steam steriliser room increases somewhat. The steam mixes with the air in the steam steriliser room and escapes from the steam steriliser room via a ventilation opening. The longer the boiling and ventilation, the more air is forced out of the steam steriliser room until there is virtually pure steam in the steam steriliser room. The pressure then continues to increase to 1 or 2 bar, whereby the sterilisation temperature of 121°C or 134 °C is reached. The major advantage of this principle is the simplicity and the consequential low costs for which a steam steriliser can be produced. However, the disadvantage of this is that the air cannot be removed from hollow objects.
- Removal of air using a multiple deep vacuum  
This is the most effective way of removing air, not just from the steam steriliser room but also and - in particular - from hollow instruments. The air is actively removed from the steam steriliser room and the products using a vacuum pump. When the air has been removed, the steam can simply penetrate into the hollow instruments. The major advantage of steam sterilisers that use a fractionated vacuum is that they can sterilise a large range of instruments.

The types of air removal described here are the two extremes. There are more ways of removing the air from the steam steriliser room and the load. All types of air removal can in theory be used; however, the suitability depends on the instruments to be sterilised. The manufacturer of the steam steriliser should carry out tests to demonstrate the suitability of the sterilisation process for the instruments.

N.B. A common practice in the Netherlands is the use of a 3-minute process at 134°C, or a 15-minute process at 121°C.

### 7.4.1.2 Drying the sterilised products

The laminate in which the instruments are packaged should be dry when the steam steriliser door is opened. Wet packaging lets bacteria through, which means that the contents will not remain sterile. The products can be dried in the steam steriliser using a vacuum pump or by blowing filtered air through them (for a long time).

- ☞ Instruments that need to be sterile (as they are used to puncture mucous membranes) should be sterilised packaged and stored packaged after the sterilisation process; therefore, the steam steriliser should be capable of drying the packaging and the contents at the end of the sterilisation process [17].

### 7.4.2 Validation

- ☞ The manufacturer should have demonstrated the suitability of the steriliser for the intended application.
- ☞ Validation by the user is required if the user wants to sterilise instruments or products that fall outside the intended application of the steriliser.
- ☞ Periodic maintenance of the steam steriliser should be carried out in accordance with the manufacturer's or importer's instructions. Maintenance should be followed by simple control measurements to guarantee the proper functioning of the steriliser.

The range and development of instruments used in dental practice is limited, stagnant and unvaried between the different practices. The range can be well estimated by the manufacturer of the steriliser, and should be taken into account during the design of the steriliser. The application and the limitations of the steriliser should be clearly stated. If the user merely uses the steriliser for the application stated by the manufacturer, an extensive validation - such as that carried out by hospitals - is not necessary; periodic maintenance followed by control measurements is sufficient. Guidelines are currently being prepared by the standards commission on Sterilisation and Sterility.

## 7.5 Methods to clean, disinfect and sterilise instruments

### 7.5.1 Cleaning

- ☞ The instruments should be cleaned before the disinfection or sterilisation process; great care should be taken with the inside of hollow objects. The inside can be cleaned using inter-dental brushes or a water pressure gun.
- ☞ The instruments should be properly dried after cleaning.

### 7.5.2 Sterilisation of instruments in category A (see Table 1).

- ☞ Separate instruments should be packaged before they are placed in the steam steriliser.

Separate instruments are best packaged in laminate bags that are specially intended for steam sterilisers. The laminate bags should meet the requirements set out in NEN-EN868-5 (Packaging material and systems for medical devices to be sterilised - Part 5: Hot-sealable laminate bags and hot-sealable laminate on a roll manufactured from paper and plastic film – Requirements and test methods). There are various sizes of laminate bags, which should be sealed; and there is laminate on a roll, which should be sealed on both sides. It is not enough to close the laminate bags by folding them over unless bags with an adhesive strip are used. Sets and sharp or delicate instruments can

be packaged and sterilised in wire baskets with a single or double layer of 'non-woven' around them. Sheets of 'non-woven' should comply with NEN-EN868-2 (Packaging material and systems for medical devices to be sterilised - Part 2: Sheets of packaging material for sterilisation requirements and testing methods). Further information about the method of packaging using sheets of 'non-woven' is given in the NEN guideline R3210 (Packaging of medical devices to be sterilised in institutions and sterilisation companies).

- ☞ If there is no indicator strip on the packaging material, a piece of indicator tape should be attached. This indicator strip (or tape) can prevent confusion with non-sterilised instruments.
- ☞ After completion of the disinfection process, hands should be washed or rubbed with hand alcohol before the instrument washing machine is emptied.
- ☞ There should be a clean area for the load that comes out of the steam steriliser.
- ☞ The load should be left to cool for at least half an hour after sterilisation.
- ☞ The sterilised instruments should be stored in their packaging in a clean, dry, dust-free place.
- ☞ A sticker should be attached to the laminate side of the packaging stating the sterilisation date and the date until which the sterility is guaranteed.
- ☞ The shelf life of packaged sterilised products is six months as long as the storage of the sterilised products is in closed drawers or cupboards.
- ☞ Sterilised packaging is vulnerable. The following things should be taken into consideration.
  - Do not write on the packaging; instead, attach a pre-written sticker to the laminate packaging. A pen will easily puncture the paper or the laminate.
  - Do not make bundles of laminate bags; therefore, do not use staples, paper clips or elastic bands.
  - Do not cram laminate bags into cupboards or drawers.
  - Do not store laminate bags in places where they could get damp or wet, such as on the kitchen sink unit.

### **7.5.3 Sterilisation of instruments in category B (see Table 1).**

- ☞ If the decision to sterilise is taken, the sterilisation should be carried out in the same way as the sterilisation of instruments in category A, with the difference being that these instruments do not need to be packaged.
- ☞ There should be a clean area for the load that comes out of the steriliser.
- ☞ These instruments should be stored in a clean, dry, dust-free place (e.g. in a closed cupboard or drawer) after sterilisation.

### **7.5.4 Thermal disinfection of instruments in category B**

- ☞ Thermal disinfection should be carried out in an instrument washing machine that is designed in such a way that the inside of instruments with hollow spaces is also cleaned and disinfected adequately. This machine cleans and disinfects in a single process. Specifications should comply with NEN-EN-ISO 1588-3-1.
- ☞ After completion of the disinfection process, hands should be washed or rubbed with hand alcohol before the instrument washing machine is emptied.
- ☞ There should be a clean area for the load that comes out of the instrument washing machine.

- ☞ The disinfected instruments should be stored in a clean, dry, dust-free place.

### **7.5.5 Disinfection of instruments in category C ( see Table 1)**

- ☞ Instruments in category C that are also used for category A or category B should be treated as instruments in category A or B.

Although this is not necessary for instruments in category C, this avoids a risky misunderstanding.

- ☞ Instruments that are used only for category C should preferably be cleaned and thermally disinfected in an instrument washing machine.

If thermal disinfection is not possible because instruments are resistant to this procedure, the instruments should be cleaned and properly dried, then chemically disinfected by being immersed for 10 minutes in 70% alcohol; they should subsequently be dried in the air.

The alcohol container should be closed off with a lid. The alcohol should be refreshed daily. The container should be emptied, cleaned, dried and then refilled with alcohol.

- ☞ Hands should be washed or rubbed with hand alcohol before the disinfected materials are touched.

- ☞ The disinfected instruments should be stored in a clean, dry, dust-free place.

## **7.6 Methods to clean and disinfect other instruments**

When dental (extraction) equipment is bought, the possibility of being able to clean it should be an important consideration. Smooth surfaces, smooth hoses and foot operation of chair, treatment unit and waste bucket contribute to the reduction in the risk of contamination and make good cleaning possible.

### **7.6.1 The treatment chair**

- ☞ The treatment chair should have as many smooth surfaces as possible.
- ☞ The chair should be cleaned using water and a detergent immediately after it becomes visibly contaminated and on a daily basis at the very minimum.
- ☞ If there are splashes of blood on the chair, these should be immediately removed with a tissue; then the cleaned surface should be disinfected with 70% alcohol. When purchasing a chair, it should be checked that the chair material is resistant to disinfection agents containing 70% alcohol.

### **7.6.2 Handles**

- ☞ The handles of lamps, X-ray equipment, treatment units, touch-control panels, timer buttons, etc, that are touched during the treatment of the patient should be disinfected with 70% alcohol after the completion of the treatment. If the handles are visibly contaminated, they should be cleaned with water and a detergent before they are disinfected.

An alternative to this is to wrap the handles in disposable plastic film and replace this after each patient.

If this is not possible, the handles can also be replaced and thermally or chemically disinfected.

### **7.6.3 Dental tray**

- ☞ The use of a disposable dental tray is preferred.
- ☞ A non-disposable tray should be disinfected after each patient with 70% alcohol. If the tray is visibly contaminated, this should first be cleaned with water and a detergent.

An alternative to cleaning is to cover the tray with protective waterproof material; subsequently, this need only be disinfected and changed.

### **7.6.4 Multi-function syringe**

The tip of the multi-function syringe should not be reused.

- ☞ After each patient, the multi-function syringe should be rinsed for 10 seconds with water and air. The used tip of the syringe should be removed before rinsing.
- ☞ The outside should be disinfected with 70% alcohol after each patient.

### **7.6.5 Holders**

- ☞ The holders of rotating instruments, extraction hoses, multi-function syringes, etc. should be disinfected with 70% alcohol after each patient. In the case of visible contamination, this should be preceded by cleaning with water and a detergent. Only after disinfection of the holder should the disinfected instruments be returned to this. The order this occurs in is very important.

### **7.6.6 Extraction unit**

- ☞ The extraction hose should be briefly rinsed with clean water after each patient.
- ☞ The extraction hoses should be cleaned at the end of every day by sucking up a detergent in warm water through the hoses.

The choice of detergent depends on the manufacturer's instructions. If the wrong detergent is used, the formation of foam can result in problems occurring in the extraction unit's motor.

- ☞ When the screen or the hoses of the extraction unit are cleaned or replaced, there is always the risk of splashes.
- ☞ Gloves (rubber), mask and protective glasses should be worn when the amalgam separator is cleaned or replaced.

### **7.6.7 Spittoon**

- ☞ The spittoon should be properly rinsed with water after every patient. If necessary (if it is visibly contaminated), first left-over impression material, etc. should be removed and then the spittoon should be cleaned with a tissue using water and a detergent.

### **7.6.8 Other dental equipment**

- ☞ The operating controls that are touched should be cleaned after use with water and a detergent, and then disinfected with 70% alcohol.
- ☞ The (soft) laser should be fitted with replaceable tips, which should be thermally disinfected after use. The lightstick should be thermally disinfected and the lamp should be disinfected with 70% alcohol.

### **7.6.9 Hand pieces and other intraoral instruments**

As a result of the technical design of hand pieces and other intraoral instruments, there will be contamination of the inside of these pieces during use. Consequently, it is necessary to clean these then to disinfect or sterilise them after use for each patient.

The cleaning of hand pieces and other intraoral instruments requires special attention. The rinsing of these, as is done before sterilisation, cannot be regarded as cleaning. In addition to the removal of any blood and saliva, good cleaning means the removal of any remaining oil. This requires treatment with a detergent.

After sterilisation or thermal disinfection, the hand pieces and other intraoral instruments can be oiled. Only by following the steps - cleaning, thermal disinfection or sterilisation, and oiling - in this order can there be sufficient certainty that the handpiece is microbiologically safe.

There is special equipment for the cleaning, disinfection or sterilisation and oiling of hand pieces and other intraoral instruments. The purchase and use of this equipment is strongly recommended, also for reasons of microbiological safety. This also saves on maintenance costs and ensures that the hand pieces and other intraoral instruments last longer.

### **7.6.10 Administrative equipment**

- ☞ Administrative equipment should preferably be outside the splash zone.
- ☞ Computers, telephones and other office equipment should be cleaned domestically.  
Keyboards and mice can best be protected with a flat, smooth, plastic cover that is easy to clean and to disinfect or can be replaced.
- ☞ If this equipment is touched with contaminated hands or gloves during treatment, it should also be disinfected after treatment.

### **7.6.11 Animals and plants**

- ☞ The presence of animals and plants is not permitted in the critical area<sup>2</sup>. Exceptions may be made for guide dogs.

## **7.7 Methods to clean and disinfect areas and bathrooms**

### **7.7.1 Cleaning frequency**

- ☞ The non-critical areas should be cleaned on a weekly basis at the very minimum, and the semi-critical and critical areas daily.
- ☞ Pedal bins and waste-paper baskets should be emptied daily.

### **7.7.2 Method for cleaning critical and semi-critical areas<sup>2</sup>**

- ☞ 'Dry' cleaning should be carried out as much as possible, with a duster for example.
- ☞ Any contamination with organic material should be removed for example with a tissue before wet-cleaning can be carried out.

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<sup>2</sup> For a description of critical and semi-critical areas refer to section 9.2.

An alkaline cleaning agent is recommended for the daily cleaning of bathrooms. For the prevention and removal of limescale on sinks and toilets an acidic (decalcifying) agent is recommended.

### **7.7.3 Disinfection**

In general cleaning does not need to be followed by disinfection [18].

If blood is spilt on surfaces, furniture or objects, the contaminated spot should be immediately cleaned and then disinfected with 70% alcohol, or with 1,000 ppm of chlorine. Large surfaces cannot be disinfected using alcohol because of the risk of fire. The contaminated spot should be dried in the air after disinfection. Prior cleaning is required as disinfectants are to some extent rendered ineffective by organic material such as blood (proteins) [19].

### **7.7.4 Maintenance of the cleaning and disinfection material**

- ☞ Disposable materials should be used as much as possible.
- ☞ Cleaning material that is reused should be cleaned, dried and cleared away daily after the work has been carried out. This helps to prevent cleaning being carried out with contaminated objects and the opposite result being achieved: an even greater contamination.
- ☞ If brushes are required, plastic brushes should be used as wooden brushes are difficult to clean.
- ☞ If a brush is used for cleaning an item that is potentially contaminated with blood, the brush should be disinfected after cleaning for at least five minutes using a 1,000 ppm of chlorine solution, then rinsed, dried completely in the air and stored dry.
- ☞ If a bucket is used for cleaning an item that is potentially contaminated with blood, the bucket should be disinfected after cleaning for at least five minutes using 1,000 ppm of chlorine.
- ☞ Disposable absorbent cloths should be used. If these are reused, they should be washed in a washing machine.
- ☞ Sponges and chamois leathers may only be used for cleaning of windows and mirrors.

## **8 Removal of waste**

- ☞ Household waste should be put out for the refuse collection service in the usual way.
- ☞ Material that is contaminated with blood should be placed in a sturdy plastic bag before it is deposited in the dustbin.
- ☞ Full needle containers are seen as waste that has a risk of infection; therefore, they may not be put out with the normal waste. The best thing to do is to hand them over as chemical waste (using an environmental box).
- ☞ The content of screens and extraction units, and left-overs from the amalgam separator should be thrown away as chemical waste.

## 9 Safe working practices in dental practice

### 9.1 General

- ☞ The dentist and the employees should adopt safe working practices and pay ongoing attention to the prevention of infection; in other words, in accordance with the 'best practice' rules of dentistry.
- ☞ Treatments should be carried out in such a way that the risk of contamination for the dentist, patient, employees and workplace is minimised. The underlying notion for this is that work should be carried out with assistance.

Other important conditions are the organisation of the practice, the ergonomic layout of the practice, the correct routing of clean and contaminated equipment, a tidy workplace, and application of this guideline.

### 9.2 The work area

The optimum separation of 'clean' and 'unclean' aspects - such as the layout of the practice, the materials, the routing and the treatment - is an essential basis for hygienic practices.

The areas in the dental practice should be categorised as:

- critical areas (treatment room, laboratory, area where the instruments are cleaned and disinfected)
- semi-critical areas (toilets)
- non-critical (public) areas (entrance, corridor, office, waiting room).

#### 9.2.1 Layout

- ☞ There should be separate areas within the dental surgery for treatment and administration; as well as for cleaning, disinfection and the sterilisation of equipment and materials.

#### 9.2.2 Furnishing

- ☞ The treatment room should have sufficient worktop surfaces, with a clear separation between 'clean' and 'unclean'. The hand-washing unit should always be located on the 'unclean' worktop.
- ☞ The areas for cleaning, disinfection and sterilisation should be divided into a clean and a contaminated area.  

Cleaning and disinfection should take place in the contaminated area; packaging and sterilisation should take place in the clean area.
- ☞ During furnishing, attempts should be made to ensure that all the surfaces can be cleaned easily and properly.
- ☞ Smooth surfaces without seams and cracks are preferred as these can be cleaned more easily.
- ☞ As little separate equipment and material as possible should be placed on the worktops. Equipment and materials that are used only occasionally should be stored in closed cupboards.

This reduces the risk of contamination and means there is less to be cleaned.

- ☞ Clean and sterile equipment and materials should be stored in closed cupboards or drawers.

Clean, dry cupboards are required for the storage of equipment, and there should be sufficient room in these cupboards to store the equipment separately. An overfull drawer or cupboard causes crumpled packaging, which can cause hair cracks in the packaging that may result in the sterility of the contents being affected.

### 9.3 The treatment unit

There are two major problems with regard to the treatment unit: contamination of the inside caused by a reflux of water into the system when the spray water feed is turned off; and a reduction in the microbiological quality of the water because it stagnates in the pipeline.

#### 9.3.1 Reflux

A treatment unit should have a device that prevents the reflux of water in the pipes (anti-retraction valves).

#### 9.3.2 Stagnancy of water in the pipes

Stagnancy of water (at night and at the weekend) causes the formation of a biofilm on the inside of the plastic pipes of the unit and the growth of various bacteria, including *Legionella* [20-22]. Rinsing these pipes achieves a 10-fold – 20-fold reduction in the number of distally forming bacteria [23].

- ☞ In the morning and before the first treatment, all the pipes running from the unit to the instruments (multi-function syringe, airtor, micromotors, assistant's multi-function syringe, cavitron) should be rinsed; and it must be ensured that all the instruments/openings are separately rinsed through for at least 30 seconds.
- ☞ The used pipes, without the hand pieces and other intraoral instruments, should be rinsed through for at least 10 seconds between consultations. This is not necessary if instruments with anti-retraction valves are used.

Disinfecting the pipeline system and/or adding a disinfectant to the unit water results in a water quality that in many cases meets the required bacteriological standard of <200 kve/ml [24-30].

When a new unit is purchased, it is recommended that a unit be chosen which has an integrated, often semi-automatic water disinfection system. These modern units usually guarantee an easy, reliable disinfection of the water and the pipes. Units with this kind of system should be fitted with a reflux device (BA safety device) to prevent the water flowing back into the network (NEN-EN 1717).

Units that are not yet ready for replacement can be disconnected from the water pipe and fitted with a bottle that makes it possible to (manually or automatically) disinfect the bottled water and, thus, the water in the unit's pipes. Compressed air in the unit should then be used to move the water-plus-disinfectant from the bottle into the pipes. In general, disinfectants with hydrogen peroxide or preparations based on peroxides produce good results [26]. The concentration of the hydrogen peroxide in the bottled water is around 300 ppm (0.03%). This can be checked using peroxide test strips. Pipes on units with a bottle device can also be disinfected by leaving a special disinfectant in the pipes over the weekend. Ordinary tap water can then be used in the bottle during the week.

### 9.3.3 Aerosols

- ☞ The spread of aerosols should be kept to a minimum with the help of an effective mist extractor.

## 9.4 Other materials

### 9.4.1 Hot-water bath

- ☞ The temperature of the water in the hot-water bath used to melt wax should be raised to 95°C for five minutes at the end of each working day, as the water is a potential source of contamination.
- ☞ At the end of the working week, or if the bath has not been used for over 24 hours, it should be emptied after boiling.
- ☞ To prevent contamination of the water, no hands should be placed in the water. Wax sheets should be placed in the bath using tweezers and taken out again using tweezers.
- ☞ Material that has been in contact with a patient (objects or wax) should never be placed (again) in the water bath.

### 9.4.2 Hydrocolloid conditioner

- ☞ The hydrocolloid impression material should be placed in the thermostatically controlled water bath (temper-bath) in the tube, and not on a spatula.  
This prevents the impression material being contaminated by the conditioner water.

### 9.4.3 Materials and stocks

- ☞ Materials such as rolls of cotton wool, pellets of cotton wool and articulation paper should be stored and covered in such a way that it is impossible for these materials to be contaminated in the case of aerosol formation during a treatment.
- ☞ For each treatment only the materials required for this treatment should be prepared. Unused materials that have been within the splash zone during the treatment are regarded as having been used during the treatment.

### 9.4.4 Drills

- ☞ The drills should be stored in such a way that they cannot be contaminated by splashes or aerosols during the treatment.
- ☞ For each treatment, the drills required for this treatment should be prepared.

### 9.4.5 X-ray equipment

- ☞ The X-ray equipment may be operated with used gloves as long the parts touched are disinfected with 70% alcohol following the end of the treatment.
- ☞ The packaged image should be rinsed with tap water before it is inserted into the developer.  
This is not necessary if a system is used that has a separate protective film around the image.
- ☞ Parts of the developer that have been touched should be disinfected using 70% alcohol.

Digital X-ray equipment uses a sensor that is connected to the computer via a cable or phosphorous plates.

- ☞ The sensor is used with a sleeve; this should be put in the waste after use.
- ☞ The phosphorous plate is used with a sleeve that should be disinfected using 70% alcohol after use; the sleeve should then be removed and put in the waste. The phosphorous plate can now be read in.

#### **9.4.6 Impression material**

- ☞ Before impression material can be sent off, it should be cleaned using water. Then the impression should be immersed in 0.1% hypochlorite for five minutes. The impression should then be rinsed under the tap and packed in a plastic bag.
- ☞ No soap should be used for the cleaning as this can adversely affect the quality of the impression.

#### **9.4.7 Pieces of work that come from a dental laboratory**

- ☞ Pieces of work from a dental laboratory should be rinsed and disinfected using 70% alcohol before they are tried or fitted.
- ☞ Pieces of work that are returned to a dental laboratory should be disinfected in the same way as impressions.

## **10 Surgical interventions**

- ☞ An assistant should always be present when surgical operations take place. Sterile operations should be carried out in an independent treatment room that meets the requirements set out in the WIP guideline: *Circumstances during (minor) surgical and invasive procedures* (Tables 2 and 3).
- ☞ The dentist and assistant(s) should wear (a) clean protective jacket(s) and the other personal protective equipment.
- ☞ The patient's face should be covered with a sterile cloth (also a sterile area).
- ☞ In the case of surgical operations, sterile equipment and sterile materials should be used that have been laid out in a sterile area.
- ☞ The rotating instruments should be connected to an external water-cooler that is supplied with sterile water or a sterile physiological salt solution.
- ☞ Sterile water or a sterile physiological salt solution should always be used for rinsing the wound area.

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