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The essentials of **disinfection and decontamination**

Kathy Porter, Senior Dental Nurse (Decontamination) at Birmingham Dental Hospital, highlights her perception of "Best Practice" for disinfection and decontamination within Hospital and General Practice environments.

Infection prevention and control is the single most important practice that all the dental team are involved in. It is important to emphasise that infection prevention and control is the responsibility of everyone, not only within the team but also the people that visit your premises and they should have every encouragement to participate in good practice.

The General Dental Council (GDC) recognises the importance of this subject by making it a compulsory subject for Continuing Professional Development (CPD) for not only Dentists but also Dental Care Professionals (DCP's).

The whole subject of Infection Prevention and Control is huge and I can only cover one small part of this in this article. Hopefully you will feel that it has given you food for thought and inspires you to do more reading and research of your own. My book, The Dental Nurses Guide to Infection Control and Decontamination by Quay Books, gives more in-depth information and sources for further study.

The GDC requires DCP's to complete 5 hours of disinfection and decontamination CPD in every 5 year cycle. This is a small but essential part of the whole subject and is arguably the most important. There can be no effective infection prevention and control without effective and efficient disinfection and decontamination. These two are similar but not the same and the differences must be clear to whoever is performing the task. Confusion could lead to patients being put at risk.

Disinfection1 has been defined as a process used to reduce the number of micro-organisms, but which does not usually kill or remove all the micro-organisms, rather it reduces them to a level which is not harmful to health.

Decontamination1 is a term used for the destruction or removal of microbial contamination to render an item safer to handle.

Basic disinfection procedures

Disinfection should only be used as a means of decontamination for those items or pieces of equipment which cannot be sterilised by autoclaving. It should never be used as a "quick fix" to save time.

In general this relates to large pieces of equipment such as the dental chair and unit, work surfaces etc. The only small items which should be disinfected are items such as protective glasses, some cheek retractors, some photographic mirrors, impression materials etc. The key phrase that drives this is "follow the manufacturers' instructions"; this also applies to

Picture 1. A typical infection control range including hard surface disinfectant spray, foam, wipes and instrument cleaner.

decontamination advice and sterilisation.

No item designated as "Single Use" should ever be disinfected, decontaminated or sterilised and used a second time.

Large items of equipment should be cleaned using an appropriate cleaner as advised by the manufacturer and then wiped over using a recommended disinfectant. This should be made up to the correct concentration when necessary and applied in the recommended way.

When choosing a suitable disinfectant the bactericidal, virucidal and fungicidal properties should be carefully studied as these are essential for an effective disinfectant. A product which has all these properties will give the best possible spectrum of protection.

For small items, once they have been disinfected, they can be stored in sterilisation pouches to help prevent recontamination. For such items, it may be appropriate to use a similar solution as that used to disinfect items to be sent to the laboratory or for repair. This will entail soaking them in the solution for the recommended time and then rinsing and drying them. For things like protective glasses all that can be done is to wipe them thoroughly using a disinfectant solution or wiping them with an alcohol impregnated wipe.

Picture 2. Impregnated wipes are ideal for disinfecting protective glasses etc.

Up until 20th March 2010 any disinfectants for use with Medical Devices, items considered to be invasive e.g. impression trays etc, only had to have Classification 11a in order to affix the CE mark. However, the risk has been reassessed and since 20th March 2010 all Medical Devices considered to be invasive have to be disinfected with a Class 11b Disinfectant, as amended by Directive 2007/47/EC. Only disinfectants that have achieved this standard can now carry the appropriate CE Mark.

Whenever handling, mixing or disposing of disinfectant solutions, Personal Protective Equipment must be worn. There should also be a Control of Substances Hazardous to Health (COSHH) risk assessment carried out, documented, updated regularly and kept in the area where the substance is being used. It is also essential that all staff who come into contact with it or use it, are adequately trained in its safe use and storage.

Decontamination

The whole decontamination process is one which renders a contaminated item safe to use on a subsequent patient, by virtue of the fact that all pathogenic micro-organisms have been killed or removed from the item. The process is complete when the item has been sterilised, usually by autoclaving which is the stage when all the pathogens are destroyed. This can only be achieved if the item has been effectively decontaminated before sterilisation.

It should be remembered that although sterilisation will kill or destroy all pathogens it will not necessarily destroy Prions which are not living organisms, but mutant proteins.

The decontamination prior to sterilisation must remove all deposits, blood and saliva. The enzymes in blood and saliva will prohibit the action of the steam against the material of the item, thus giving incomplete sterilisation. Any debris left on the item will not allow penetration of the steam underneath it, so that area will not be sterile.

The first stage in this process is cleaning. This can be achieved by one of two methods:

i) Manual Cleaning

Manual cleaning should be restricted to those large items which cannot be mechanically cleaned i.e. The dental chair and unit etc. It is not recommended for instruments etc. For two main reasons:-

a) Danger of the operator receiving a percutaneous (sharps) injury.

b) Thorough removal of all blood, saliva and debris is very difficult
manually.

However it is a fact that not all practices have a mechanical cleaning facility, so instruments have to be cleaned manually. This should be carried out in a designated sink which is used for this purpose only and is deep enough so that the instruments can be totally immersed in water during cleaning. Debris should be removed using either a disposable or autoclavable brush or some form of disposable scourer. A brush or scourer should not be used on more than

Picture 4. Instrument disinfectants combined with ultrasonic cleaners remove blood, saliva and other debris.

one set of contaminated instruments. If a brush is used, it must be autoclaved after each set of instruments has been cleaned.

Picture 3. Foam based products are ideal for cleaning dental chairs and units

After cleaning and before loading into an autoclave, they must be checked for visible cleanliness. If they are not clean then they must be cleaned until they are. If clean, they should be thoroughly rinsed, carefully dried, using disposable cloths and then spread out on an autoclave tray.

Full Personal Protective Equipment (PPE) must be worn to perform this operation.

ii) Mechanical Cleaning.

There are two main types of mechanical cleaner, an Ultrasonic Bath or a Washer / Disinfector. Manufacturers' instructions must be followed for the installation, use and servicing of both types of machine. Instruments decontaminated in either machine, must be sterilised before use. They do not sterilise only decontaminate.

Picture 5. Ultrasonic cleaners use high frequency sound waves to agitate the cleaning solution

a) Ultrasonic Baths

These work by using high frequency sound waves to agitate the solution and produce millions of tiny bubbles, which implode against the instrument, forcing the debris, blood or saliva off. They must be subjected to weekly tests as to their efficiency, which must be documented and kept for audit purposes. They also need to be calibrated when first bought to find the optimum time that instruments should stay in them for.

The solution should be a recognised enzymatic solution which will break down the enzymes left by blood and saliva which would inhibit sterilisation. It is not sufficient to just put washing up liquid into the water.

Instruments must be put into a basket in the bath and not straight onto the floor of the bath to allow circulation of the cleaning fluid. The bath should also have a tight fitting lid which must always be in place when the bath is in use. This is because an aerosol is produced by the bubbles, which is made up of a mixture of cleaning solution and contaminated particles for the instruments.

After removal from the bath, they must be rinsed to remove the enzymatic cleaner and then carefully inspected for cleanliness. If visibly clean then they should be dried and spread out on an autoclave tray and then autoclaved.

As with manual cleaning full PPE must be worn by staff dealing with contaminated instruments and using the ultrasonic bath. There should also be COSHH risk assessments available for the solutions used.

The bath should be emptied and cleaned at least at the end of every session but more often if the water becomes heavily contaminated or obviously dirty. It should be emptied every time it is used to decontaminate heavily blood contaminated items such as forceps, elevators or surgical instruments.

b) Washer / Disinfectors

These are a relative new innovation for dental surgeries, although they have been used for some time in large purpose built decontamination facilities. They are, basically, sophisticated dish washers. The disadvantages of these machines are – large pieces of equipment, although bench top versions are now available; expensive to buy; time consuming to use; need to have regular maintenance from outside technicians; and need to be plumbed into both the water and waste systems.

There are advantages, these being – give a high level of decontamination; instruments come out dry reducing the risk of percutaneous injury during drying; make the instruments safer to handle; and they decontaminate the lumens inside handpieces etc.

Picture 6. Autoclaving at an appropriate cycle completes the sterilisation protocol

Users must wear full PPE when using the machines and COSHH risk assessments for the solvents used must be available in the area of the machine. All staff using it must be adequately and appropriately trained in its use.

When instruments are removed from the machine they must be checked for cleanliness prior to spreading out on an autoclave tray ready for sterilising.
The mechanical cleaning systems should be the systems of choice but if they are installed, back up systems must be in place to cope with any breakdowns or malfunctions.

The decontamination process is completed by the instruments being sterilised.

Briefly, sterilisation is effected by the action of steam under pressure. This is achieved with a displacement autoclave or a vacuum phase autoclave. The recommendation is to buy a vacuum phase model as this will ensure the complete sterilisation of all surfaces, including the lumens inside handpieces.

The most commonly used temperature / time cycle is 1350 C for a minimum of 3 minutes. Some more delicate instruments need to be sterilised at a lower temperature for a longer time. Again the manufacturer's instructions should be followed. Instruments should be spaced out on the trays to allow adequate exposure of all surfaces to the steam and the autoclave should not be overloaded.

Autoclaves should be drained at the end of each day and left clean and dry. They are also subject to mandatory checks, daily, weekly, quarterly and yearly, all of which must be fully documented and kept for audit purposes.

Disinfection and decontamination should be carried out in a designated "dirty area" and sterilisation in a designated "clean area". There must not be any overlapping of the processes carried out in each area or effective sterilisation will not be achieved.

After sterilisation, instruments taken from a displacement autoclave need to be dried and packed in pouches to be stored. They must not be sterilised in pouches, only instruments going through a vacuum phase autoclave can be packed in pouches prior to autoclaving.

It is imperative that sterilised items are stored in clean dry conditions and used in rotation.

This is only a brief overview of a complicated process and should provide the stimulus for the reader to learn more and look at their own disinfection and decontamination practices as well as those of other staff.

Reference:

1. The Dental Nurses Guide to Infection Control and Decontamination – Kathryn Porter – Quay Books – 2008

Further Guidance:

1. BDA Leaflet A12 – Infection Control in Dentistry – BDA 2003.
2. British Association of Dental Nurses – Health and Safety Group.

Disclaimer.

The pictures used to illustrate this article show examples of some of the many products available in this field. The author does not endorse these or any other product, this must be a decision made by the user.

About the Author

Kathryn (Kathy) Porter has been a qualified and now registered Dental Nurse for 38 years mainly spent in various guises at Birmingham Dental Hospital. Her title now is – Senior Dental Nurse (Decontamination). She is a member of the editorial board of the "Dental Nursing" Journal and also write articles for them. She has had a book, entitled "The Dental Nurses Guide to Infection Control and Decontamination", published in the spring of 2008.

Kathy is a trained Infection Prevention and Control Link Practitioner and co-ordinates the group of Link Practitioners at Birmingham Dental Hospital. She is a Fellow of the BADN.

Key Learning Points

* The important of infection prevention and control within the Laboratory

* The difference between disinfection and decontamination

* An explanation of the various methods available for implementing proper disinfection and decontamination protocols

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1) How many hours of CPD disinfection and decontamination does the GDC require DCP's to complete?

a) 5 hours every year

b) 10 hours every year

c) 5 hours in every 5 year cycle.

d) 10 hours in every 5 year cycle

2) Disinfection has been defined as :-

a) the destruction or removal of microbial contamination to render an item safer to handle

b) a process used to kill or remove micro-organisms, reducing them to a level which is not harmful to health

c) a process used to reduce the number of micro-organisms, but which does not usually kill or remove all the micro-organisms, rather it reduces them to a level which is not harmful to health.

3) Decontamination is a term used for the :-

a) destruction or removal of microbial contamination to render an item safer to handle.

b) a process used to kill or remove micro-organisms, reducing them to a level which is not harmful to health

c) a process used to reduce the number of micro-organisms, but which does not usually kill or remove all the micro-organisms, rather it reduces them to a level which is not harmful to health.

4) To be an effective disinfectant a material should be :-

a) bactericidal

b) virucidal

c) Fungicidal

d) all three

5) The most commonly used temperature/time cycle for an autoclave is :-

a) 1210C for a minimum of 3 minutes

b) 1350C for a minimum of 3 minutes

c) 1210C for a minimum of 10 minutes

d) 1350C for a minimum of 10 minutes

Name:

GDC Number

Address:

Postcode:

Telephone no: (in case of any queries)

Signed:

Date:

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