In our first article on cross-contamination in the dental laboratory, we discussed the risks associated with contamination and where the responsibility for disinfection of dental devices should lie. In this second article, the author will examine steps that can be taken to prevent contamination from occurring in the lab.

Dental laboratories are frequently overlooked when providing control measures and guidance for infection prevention. This is despite the fact that dental technicians are as at risk as other dental healthcare professionals of acquiring a transmissible infection, unless adequate infection control precautions are implemented and adhered to.

The lack of current guidance is further complicated by the fact that there is ambiguity as to how a dental laboratory should be classified; this will directly affect the level and type of precautions required, as these are based on risk assessment of the agents that staff routinely come into contact with and the level of risk these present.

Whilst most dental laboratories do not generally have direct clinical contact with patients, this can occur. Clinical dental technicians and labs that provide shade taking services must follow the same hygiene procedures as dentists in order to prevent cross contamination.

Infection Control in the Dental Laboratory

Even when not in contact with patients, potential routes for the transmission of infection do still exist via direct contact with blood or saliva through cuts and abrasions on the skin, accidental percutaneous exposure when using sharp instruments, slurry spatter and airborne infection from aerosols created during laboratory procedures.

Items that have been contaminated with the blood, saliva or respiratory secretions of a patient must be disinfected prior to handling. In the UK, dentists are responsible for the disinfection of all dental impressions and dental prostheses. Effective communication between the lab and the dental surgery is essential in order to ensure that appropriate disinfection procedures are followed. In other countries, dentists may not have an obligation to disinfect items prior to sending them to the lab.

This article will explore other potential sources of infection that exist within the laboratory and the measures that can be taken to minimise these risks.
Standard Infection Control Precautions

As evident from the list of SICPs in Box A, whilst all of these precautions are applicable in all healthcare settings, they are not all relevant to dentistry due to the nature of our work. This is particularly true in the laboratory, where there is no direct patient contact.

Routine Implementation

Those SICPs that are of relevance however, must be implemented routinely such as hand hygiene, which is considered the single most important action to minimise the risk of transmission of infection (fig. 1). Hand hygiene can be carried out using soap and water or an alcohol-based hand rub, which provides rapid hand disinfection and can be used in all situations as long as hands are not visibly contaminated, in which case hands must be washed with soap and water to remove the contaminant.

PPE, control of the environment, safe segregation, disposal of waste and occupational exposure management are also of relevance, and local policies regarding these must be adhered to by all laboratory staff. In addition, all dental technicians must be aware of their immune status, including Hepatitis B, as immunisation will substantially reduce both the number of staff susceptible to vaccine-preventable diseases and the potential for disease transmission to other staff and patients.

Disinfection

Impressions, prostheses and appliances

The principal route for transmission of infection from patient to technician is via contaminated impressions, prostheses and appliances as these items frequently become contaminated with blood, saliva, respiratory secretions and/or other debris, which may contain bacteria, viruses and fungi.

Responsibility for ensuring all items sent to the laboratory are appropriately disinfected lies with the dental practice or clinic and can be carried out using a variety of methods and disinfectant solutions.

The issues relating to the disinfection of dental impressions and communication with the dentist were discussed in length in our first article on Cross Contamination in the Dental Lab (Dental Technologies issue 115, page 12).

One important issue that was raised related to the disinfection methods used.

When considering methods of disinfection, two factors are of importance: the effect the disinfectant will have on the dimensional stability and surface detail of the impression and the deactivating effect the impression material may have on the disinfectant, thereby reducing the efficacy of the process.

Disinfection by immersion is generally preferred to spraying. This method is more likely to ensure that all surfaces of the impression, prostheses or appliance, and in particular any undercuts, are fully exposed to the disinfectant solution for the recommended time. It has conversely been suggested that spraying disinfectant may reduce the risk of distorting the impression. From a Health and Safety perspective, one benefit that immersion disinfection has to offer is the reduction of risk to staff from inhalation of chemicals when carrying out the disinfection process.

Whilst the method and type of disinfectant used is of importance, rinsing the impression, prostheses or appliance before and after disinfection is also necessary.

Rinsing prior to disinfection will remove any blood, saliva or debris present that may prevent exposure of all surfaces of the impression, prostheses or appliance to the disinfectant. Rinsing afterwards is necessary to remove any residual disinfectant that may affect the stone surface of the cast after it has been poured.

As the dental practice and laboratory are frequently not in the same physical facility, there is a risk of cross-contamination between the two settings and effective communication between the two is required. A laboratory should clearly articulate their infection control requirements for submission of work which the dental practice or clinic must comply with and clearly identify, with a written record, that this has been carried out to the requested standard. All prostheses and appliances delivered to the patient must be free of contamination and disinfection is therefore also required, prior to fitting a prosthesis or appliance, to reduce the risk of transmission of infection to the patient. Again, effective communication between the laboratory and dental practice
or clinic is necessary to determine who is responsible for the final disinfection process as this will ensure no confusion arises as to who has final responsibility for this.

**Pumice Slurry and brushes**

Another major source of cross-contamination in the dental lab comes from pumice slurry and brushes used to polish a denture before returning it to the dentist for fitting in the patient’s mouth. One study found that slurry samples were heavily contaminated with pathogenic micro-organisms, and that adding disinfectant lowered the bacterial count (1).

This means that slurry, polishing instruments and the dental appliances being polished are all potential sources of cross-contamination. The technician doing the polishing is at risk, as well as the dentist who will handle the appliance and above all the patient who will wear it. Another study associated contaminated slurry with the high level of eye infections amongst dental technicians observed due to spatter (2).

There are several preventive measures, which are very efficient at reducing the risks of cross-contamination; these include disinfecting the pumice pan and changing pumice slurry regularly, making up the slurry using an appropriate disinfectant (fig. 2), soaking brushes and rag wheels after each use in disinfectant to ensure they are not contaminated (fig. 3) and wearing the appropriate protective clothing (such as eye protection and a dust mask to protect from spatter).

**Disinfecting surfaces**

Work benches, model trimmers and sinks also need to be cleaned regularly, ideally in-between cases if possible, but at least on a twice-a-day basis. All-purpose disinfectants are suitable for this.

**Sharps Injuries**

Healthcare workers in general are at an increased risk of blood borne pathogens because of occupational exposure to blood and other body fluids, although dental technicians do not generally come into contact with items that present the highest risk, such as hollow bone needles containing blood. Dental technicians do handle sharp items such as burs, cutters and screws on a daily basis (fig. 4), although the exposure risk from a sharps injury sustained from these items during the manufacture of a prosthesis or appliance would be minimal as they have not have been in contact with a patient or their blood or saliva and would therefore not be considered contaminated. In such an instance, whilst first aid must still be administered as required (fig. 5), post-exposure management would not be necessary, as no exposure to blood or body fluid has occurred. Similarly, if a sharps injury is sustained during the repair of a prosthesis or appliance the same principle would apply, as whilst in this instance the device will have been in contact with the patient, assuming laboratory staff are satisfied that the device has been disinfected satisfactorily prior to handling, there will again be minimal risk of blood or body fluid contamination and subsequent transmission of a blood-borne virus, although risk assessment of each individual case and the circumstances surrounding it should be carried out as per local procedure. It is necessary to ensure that lab equipment is kept clean and that it is sterilised or disinfected where appropriate.
HEALTH & SAFETY

PPE

Personal protective equipment (PPE) is designed to protect the wearer from injury or hazards that may be present within the environment (figs. 6 and 7). In the dental laboratory this would include spatter, chemicals, dust and airborne particulate matter. PPE, such as gloves, goggles and masks provide a physical barrier between the wearer and the working environment. It is the responsibility of the employer to ensure that the appropriate PPE is provided and replaced when necessary. PPE should always be used in conjunction with other control measures that minimise exposures such as local exhaust ventilation (LEV) and disinfection, as PPE only protects the wearer when worn.

Local exhaust ventilation (LEV)

As laboratory procedures generate aerosols containing dust and chemicals such as methyl methacrylate which can be absorbed in the body by inhalation, through the skin and by ingestion, all laboratories should have local exhaust ventilation (LEV) to control airborne contaminants at the point at which they are generated or released. Mechanical removal of these before they can be inhaled will minimise staff exposure to such agents and the risks associated with these.

It is of note however, that it is not only essential, but a legal requirement under the Health and Safety at Work Act 1974 and the Control of Substances Hazardous to Health Regulations (COSHH) 1992, that LEV equipment is regularly maintained and the airflow monitored at least annually. Further guidance regarding this can be obtained from the Health and Safety Executive (HSE) who have produced guidance on the requirements of employers and employees in relation to LEV.

Conclusion

Protective measures need to be taken by the lab manager and ensuring that specific hygiene procedures are put in place will mean that the risk of cross-contamination is minimised. SICPs must be followed where applicable, but obviously these are not all relevant to a dental laboratory setting.

Good organisation of the workflow and effective communication with the dental surgery are important for this, as it is through organisation and communication that appropriate disinfection and protection measures are ensured.

By Marilla Hunter
Senior Dental Nurse for Infection Control
and Honorary Teaching Fellow
Dundee Dental Hospital

References

(5) How to Handwash Poster, World Health Organisation, 2009
Health Protection Scotland, National Infection Prevention and Control Manual, Chapter 1.2
Hand Hygiene, Chapter 1.10 Occupational Safety: Prevention and Exposure Management (including sharps)
(7) Cross-infection hazards associated with the use of pumice in dental laboratories, With S. and Hart P. J Dent, 1990