



British Institute
of Dental & Surgical
Technologist

CPD Article

Issue 4



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Caring for your hands whilst preventing cross-infection

Introduction

As exemplified by swine flu, infectious diseases that previously were unheard of, can spread rapidly from country to country. Travel and migration renders unachievable the idea of containing these within discrete populations or defined geographical areas. It is no longer possible, if indeed it ever was, for those within a dental practice to identify particular patients who may be a potential risk and so infection control procedures have to be practised for them all.

A key area is the control of infection spread via the hands. Protection, of both dental personnel and patients, is provided by the wearing of good quality gloves and the practicing of a systematic hand care regime.

Infection can be transferred:

- 1 Directly from patient to DCP
- 2 Directly from DCP to patient
- 3 Indirectly from patient to patient

The first two methods are clear to understand since either a patient or DCP could have a disease that they could pass on to the other. This is why glove wearing is obligatory. Note as well that people whose immune system is weakened will be more at risk. This includes not just those suffering from diseases that affect the immune system but also the elderly, those recently hospitalised and even those recovering from a bad dose of flu.

The third area is less widely understood and refers to the transfer of infection between patients via contamination of gloves from previous patient treatment. Understanding how this can happen makes clearer the rationale behind the recommended DOH procedures for its avoidance.

Types of hand reaction in the dental surgery

There are three types of reaction that have different causes and symptoms and it is not always easy for the non-expert to differentiate between them. If you experience a hand reaction there are normally several potential causes and a methodical plan of action should be drawn up and carried out without delay. Hand reactions are not just an uncomfortable nuisance they can also cause long lasting harm. The following therefore is for general guidance only and, if in doubt, you should always consult a dermatologist who can conduct the necessary tests.

Irritant contact dermatitis initially appears as dry, itchy or scaly skin with possible fissures or cracks. It is a chronic problem caused by frequent hand washing, use of harsh disinfectants and soaps, rubbing of the gloves against already sore skin, glove powder as well as sweating. Irritant contact dermatitis can normally be dealt with by identifying and excluding the irritant(s) and a regime of improved hand care (see below).

Latex protein reaction is a Type I reaction (immediate hypersensitivity reaction). Natural Rubber Latex (NRL) gloves are made by tapping the sap from the Hevea Brasiliensis rubber tree (see Fig 1). Unfortunately NRL contains proteins that are different from our own. Our bodies recognize the fact and, beyond a certain cumulative threshold, this stimulates IgE antibodies to be produced. This reaction often appears similar to a nettle rash with an itching or tingling of the hands and wrists and typical urticaria i.e. raised pink hives on the skin. It can spread to the rest of the body, cause facial swelling and conjunctivitis as well as respiratory problems and occasionally anaphylaxis. Once sensitised to latex then the body will generate antibodies as soon as it comes into contact with, or in extreme cases, in the vicinity of, latex proteins. As those with a

latex allergy know a great number of household products contain latex and many carry no warning of the fact.

Allergic contact dermatitis is a Type IV reaction (delayed hypersensitivity reaction). It can be recognised by the skin becoming itchy, dry and scaly with thickening, fissures and blisters. It appears on the hands, frequently underneath the glove cuffs, but can spread up the arms. It is frequently caused by residues of the chemicals used in glove manufacture that have not been removed in post production processing but can also be caused by contact with chemicals that have nothing to do with the gloves themselves. A dermatologist can determine the cause via patch testing. Note that this reaction can equally occur with synthetic (nitrile) as well as NRL gloves since the chemicals used in production can be similar. The same applies to synthetic (vinyl), although the chemicals used are different.



Figure 1: Hevea Brasiliensis

Types of glove available for Surgery and Laboratory use

Natural Rubber Latex. NRL, or frequently just referred to as Latex, has been the workhorse of dental surgery gloves for the last 25 years, being comfortable to wear and an effective barrier against microorganisms (see Fig 2).

Originally gloves were powdered to help donning but alternative methods are now available so this potential hazard is no longer necessary and is indeed banned in many countries. Originally they contained very high protein levels and although these are now much lower this can never be completely eliminated. They can be reduced to extremely low levels by sequential hot washing and treatment processes in order to leach water soluble proteins from the gloves. Getting protein levels down to 50mg/g, the level in the standard, is pretty straightforward. Getting it lower is more difficult and costly to achieve as well as creating problems in measurement. However since residual chemical levels are also reduced by the same processes this is doubly worthwhile from the wearers' viewpoint. The general principle is that the lower you can reduce residual NRL protein and chemicals the less likely the wearer is to have a reaction to them.



Figure 2: Natural Rubber latex gloves with low protein levels

Nitrile synthetic rubber gloves are increasing in usage very rapidly since it is not just DCPs who may be allergic to latex (which should be known) but also patients and this fact is frequently unknown. They are not as flexible as NRL but much more flexible nitrile gloves are now becoming available and these are proving clinically acceptable (see Fig 3). They are also effective barriers against microorganisms, can give good grip and eliminate the risks of latex protein reaction in both DCPs and patients. They do not necessarily eliminate allergic contact dermatitis since the same chemicals can be used in their manufacture. Once more a rigorous regime of sequential hot washing and treatment processes are required in order to provide a really "clean" glove.

Vinyl gloves are made of PVC with added plasticisers to make them softer and more flexible. They are suitable for use when the superior barrier protection of NRL or Nitrile is not needed. So, for example, a very short (less than 10-15 minute) procedure with minimal prospect for blood or body fluid contact might be one for which a vinyl glove could be considered an acceptable choice. Since a dentist will always come into contact with blood or saliva and a nurse will wear a glove for more than 10-15 minutes, these gloves would not seem to be



Figure 3:
Flexible Nitrile
gloves

appropriate for dental use. The Scientific Committee of the European Commission on Medicinal Products and Medical Devices has expressed concern with regards to the primary plasticiser used in these gloves and strongly proposed that detailed studies are performed and further data collected in order to monitor this situation.

Recommended Hand Care Procedures

The primary method of protection is via the wearing of gloves and the different types are discussed above. However, underneath a close fitting, impermeable glove a warm, moist microclimate is formed creating the ideal conditions for any residual bacteria to multiply. This environment increases the possibility of sensitisation, not just to glove constituents but also to the chemicals used in disinfectants and soaps as well. Gloves frequently get the blame for sore hands and compromised skin but they are a long way from being the only culprit.

Hand Washing and Disinfectants

Hand hygiene is the most effective way to avoid the transmission of micro organisms. In the UK hand washing is still, in many areas, the preferred procedure for decontaminating hands. This is in spite of the numerous publications that have proven that hand washing is in fact less effective against the majority of micro organisms. Hand washing is also time consuming and can cause occupational skin irritation.

Chlorhexidine gluconate (CHD) was developed in the 1950s in the United Kingdom and later in 1970 was introduced to the USA. CHD is widely used in all areas of health care, especially for surgical hand disinfection. However, its immediate activity is slower than alcohol. It has a good activity against Gram-positive bacteria but a less good activity against Gram-negative bacteria, fungi and mycobacteria. It is not effective against bacterial spores. There is some efficacy against enveloped viruses such as herpes simplex virus and HIV, but less efficacy against non-enveloped viruses. Chlorhexidine 4 % is most likely to cause skin dermatitis in frequent use. Also, eye contact must be avoided because a concentration of even 1 % Chlorhexidine can cause conjunctivitis or serious damage to the cornea. Bacterial resistance has also been reported in recent years.

Iodine has been used as an antiseptic since the 1800s. Iodine is known to cause skin irritation and also

discoloration of the skin. Iodine and iodophors have an efficacy against Gram-positive and Gram-negative bacteria, mycobacteria, fungi and viruses. However, there is an increase in skin irritation in relation to the use of Iodine as a hand washing procedure.

Triclosan was developed in the 1960s. Triclosan is effective against Gram-positive bacteria, but less effective against Gram-negative bacteria and fungi. Most Triclosan formulations contain 2% of the active ingredient and are well tolerated by the end user. The lower activity against Gram-negative bacteria has led to reports of contaminated Triclosan.

The risk of occupational dermatitis throughout the healthcare professions is approximately six times higher than in other professions. Frequent and repeated hand washing dissolves and rinses off the skin's own fats and therefore has a negative effect on the hydro lipid film of the skin. The consequence is dry or very dry skin which promotes irritation and contact dermatitis. The risk is even higher when gloves are used frequently. Dry and rough skin can also harbour many micro organisms which, as a result, are even more difficult to remove or destroy.

The reluctance to carry out hand hygiene is much greater when skin irritation has occurred. Therefore skin irritation amongst health care professionals also results in lower compliance with the result of a higher risk of cross contamination.

Advantages of alcohol based hand disinfection Alcohol based hand disinfectants are nowadays acknowledged as being far superior to traditional hand hygiene procedures. Many professionals still face the challenge to identify a product that fulfils all the requirements – a product that offers a broad spectrum of efficacy against micro organisms, good skin tolerability and to encourage all members of staff in to very good hand disinfection compliance (se Fig 4).

The microbiological effectiveness of alcohol based hand disinfectants is strictly defined. In Europe the testing of the efficacy of hand disinfectants is performed in accordance with the test procedures of the European Norms (EN). For hygienic hand disinfection EN 1500 and for surgical hand disinfection EN 12791 are the most relevant test procedures. Both tests aim to simulate real life conditions. A suitable alcohol based hand disinfectant should fulfil the EN 1500 requirements in 30 seconds. The EN 12791 procedure for surgical hand disinfection is even more rigorous. Hand disinfection is only reliable at preventing the transmission of micro organisms when the application time is observed. An exposure time of



less than 30 seconds can result in gaps in coverage of the disinfectant and therefore insufficient inactivation of micro organisms. The procedure should be carried out properly by every member of healthcare staff (see Fig 5). Please note that the alcohol has to evaporate completely before donning the gloves. In case of micropuncture of the gloves during use the disinfectant provides additional protection against any micro organisms that could contaminate the hands of the dentist or DCP. A 30 second application time is essential for good and effective hand disinfection.

According to the World Health Organisation Guidelines on Hand Hygiene in Health Care the alcohol based product must contain at least 80 % ethanol or 75 % isopropyl alcohol.

Equally important as product efficacy is skin tolerability. The product should contain good moisturising properties. A good product fragrance is also important as this promotes compliance. Some alcohol gels have a tendency to feel sticky or tacky after several applications. This hinders the user when donning gloves. In this case an alcohol based hand rub could be a better option.

Preventing the Indirect Transfer of Infection

Gloves present an effective barrier against the direct transmission of infection between members of the dental team and patients. Changing gloves between patients,

even in the same family, prevent onward transmission between patients. However it is impossible to prevent microorganisms being transferred from a contaminated glove to the wearer's hands during their removal. Hand disinfection between patients both protects the wearer as well as prevents their transfer to the next pair of gloves and so potentially onto the next patient.

Hand disinfection should therefore be carried out at the start and end of each treatment session as well as between each patient.

Summary

Good quality gloves will offer a better biological barrier and will be less likely to adversely affect the hands. Natural Rubber Latex and Nitrile are currently the only materials which can offer sufficient barrier properties in routine dental use. There can be several causes of hand reaction and the cause concerned needs to be determined quickly to avoid discomfort and possible long term harm. Alcohol based hand disinfection is the most effective way to combat the transmission of micro organisms and can be carried out anywhere within 30 seconds.



Figure 5: Hand disinfectant Protocol according to EN 1500

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Multiple choice questions

Q1) Irritant contact dermatitis is caused by

- A) Wearing gloves for too long
- B) Natural rubber latex proteins
- C) The pigment in the gloves
- D) Frequent hand washing
- E) Harsh disinfectants and soaps

Q2) Which of the following would you associate with a Type 1 reaction?

- A) A rash on the hands that is similar to a nettle rash and can spread to the rest of the body
- B) The skin becoming dry and scaly
- C) A reaction with the chemicals used in glove production
- D) The need to change immediately to a nitrile glove
- E) Proteins from Hevea Brasiliensis

Q3) The risk of occupational dermatitis throughout the healthcare professions is

- A) Twice as much as in other professions
- B) Six times as much as in other professions
- C) Ten times as much as in other professions
- D) Ten times as much as for lawyers
- E) Less than for bakery workers

Q4) Considering alcohol based hand disinfection which of these statements is true

- A) Disinfecting your hands with whiskey is more effective than with gin
- B) A suitable alcohol based hand disinfectant should fulfil the EN 12791 requirements in 30 seconds
- C) Hand disinfection is only reliable at preventing the transmission of micro organisms

- D) when the application time is observed
- E) Hand disinfection is only important for those such as dentists and hygienists who are in direct contact with the patient
- F) According to the World Health Organisation Guidelines on Hand Hygiene in Health Care the alcohol based product must contain at least 80 % ethanol or 75 % isopropyl alcohol

Q5) You develop a rash on your hands. You should immediately

- 1) Put on lots of hand cream
- 2) Change to a different brand of gloves
- 3) Change the disinfectant you are using
- 4) Only wash your hands twice a day
- 5) Change from latex to nitrile
- 6) Determine a methodical plan of action and carry it out without delay, possibly with the aid of a dermatologist

Q6) Hand disinfection is

- A) Only necessary at the beginning and end of each treatment session
- B) Not required between treating members of the same family
- C) Not required for anyone over 65
- D) Should be carried out at the beginning and end of the session as well as between each patient
- E) Only necessary when the hands are particularly dirty

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