

# RADIATION PROTECTION for DENTISTS and ASSISTANTS

## Dental Radiography

*Hazards seldom arise from the equipment itself, but from the way it is used. You should **never** expose any part of yourself or any other person (except the patient) to the primary beam. The main source of radiation in the room, apart from the primary beam, is scattered radiation from the **patient**.*

**Distance from the patient is the main means of protection** in dental radiography. At any given distance the doses from intraoral films are lowest in an arc behind the patient's head, or at the top of the head for a supine patient. In this direction 2 metres from the patient is considered satisfactory for normal workloads.

**Panoramic dental units** have similar scattered radiation levels to intraoral machines. The primary beam is completely intercepted within the machine itself. Distance again provides the best protection.

**Shielding** is very seldom required in a dental surgery. Contact NRL for advice if you are in doubt.

**Never hold films in the patient's mouth.** If the patients cannot do this for themselves, there is usually an escort who can. The escort will be exposed only a few times, whereas staff could be exposed often. Use film holding devices where possible.

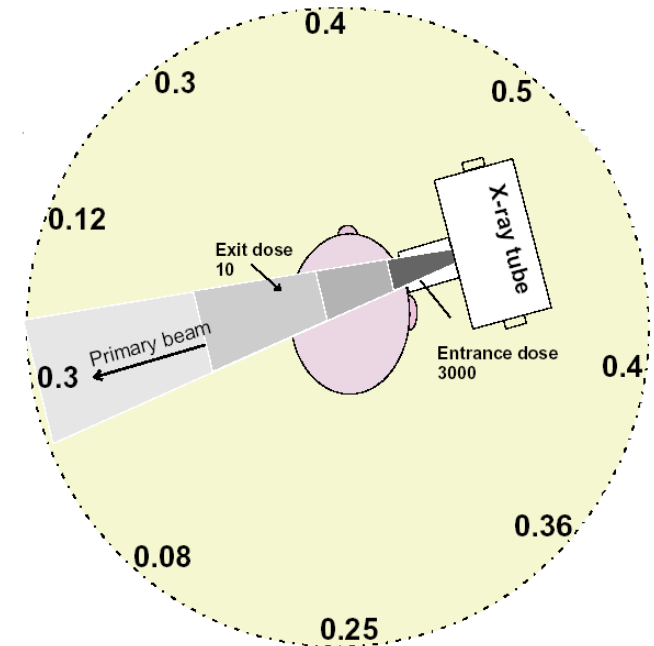
A **protective apron** for the patient has little effect in reducing the already low doses in dental radiography, but its use may reassure the patient. A **thyroid shield** has little effect for bitewing x-rays, but can be useful for some projections such as the vertex occlusal.

**Use the correct films**, and cassettes with intensifying screens where these are appropriate.

**Always use the correct technique factors.**

**Develop films according to the manufacturer's recommendations**, change chemicals regularly, and make sure the darkroom or film processor is light-tight.

**Scatter doses at 1 metre (in microsieverts) for an intra-oral exposure made at 60 kV, 0.7 sec, 200 mm focus-to-skin distance**



**These are illustrative values only. (NB: Scatter levels are highest on the entrance side of the head. Note also that the dose value given in the exit primary beam is due to both the primary beam and scatter.)**

Distance from the patient is the main means of protection in dental radiography. Standing behind the patient's head provides additional protection.

A dentist standing 2 m behind the patient's head will be exposed to about 0.2 mSv/year, for a workload of 50 films/week.

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## Radiation Doses

**Effective dose** is a term that is useful for describing the dose to the patient, as it allows for both the amount of the body irradiated and the radiosensitivities of the organs involved. It converts the actual dose distribution in the body (and its ensuing harm, ie, cancer and hereditary effects) into an equivalent uniform whole body dose that would cause the same level of harm. It is measured by

the sievert (Sv)  
thousandths of a sievert (mSv)  
millionths of a sievert ( $\mu$ Sv).

**Entrance surface dose** is a measure of the dose arriving at the patient, but does not give a very good indication of doses to organs or to a person.

**The effective dose from natural background radiation**, to which everyone is exposed, is about 2000  $\mu$ Sv per year.

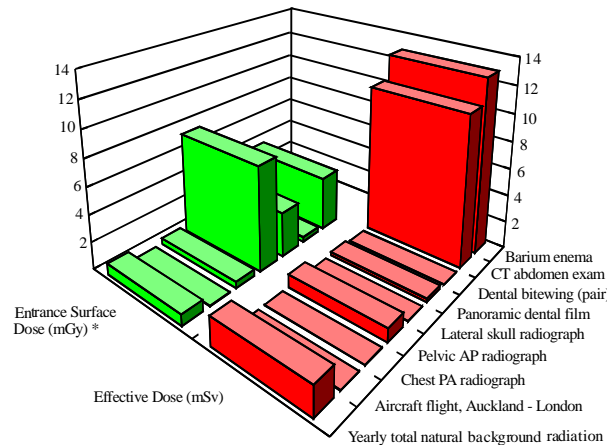
**A person standing about 2 m behind the back of the patient's head** will be exposed to an effective dose of about 200  $\mu$ Sv per year, for a workload of 50 intraoral films per week.

**The effective dose to the patient for one bitewing film** taken at 60-70 kV is about 5  $\mu$ Sv, or 10  $\mu$ Sv for the older 50-60 kV x-ray machines. For PA or OPG films the doses are about 15  $\mu$ Sv and 25  $\mu$ Sv. These can be compared with the annual dose from natural background radiation. *The use of E-speed instead of D-speed films will halve these doses.*

**The dose to the foetus from a pair of bitewing films** is equivalent to several hours of background radiation, or less than 1% of the natural background radiation received by the foetus during the nine months in utero.

There are no limits on the number of dental radiographs that can be taken. **Before taking a film be certain there is a need for it.**

## Typical radiation doses associated with some techniques or activities



\* **For complex examinations such as CT or barium enema exams, entrance surface dose is not meaningful.**

**The lifetime risk from radiation, of fatal and non-fatal cancer and severe hereditary effects**, is currently estimated to be about 7.3% per sievert, according to the International Commission on Radiological Protection (ICRP). For a pair of bitewing films the lifetime risk of harm is less than one in a million. This is about the same as smoking 1.4 cigarettes, or flying about 1000 km in a commercial airliner.

## General

All x-ray equipment, including dental x-ray machines, must be under the control of a person holding an appropriate licence issued under the *Radiation Protection Act 1965*. The legislation is administered by the National Radiation Laboratory (NRL).

X-rays can only be taken by a dentist licensed under the *Radiation Protection Act*, or by a person with an appropriate scope of practice under the *Health Practitioners Competence Assurance Act 2003* who is working under this licensee. No other person may take a dental x-ray.

The use of x-rays for dental diagnosis must comply with *NRL C7 Code of safe practice for the use of x-rays in dentistry*, which may be obtained from NRL.

Persons under the age of 18 years should not be involved with taking radiographs.

Compliance monitoring audits of dental practices in New Zealand are made periodically by NRL.

If recommended procedures are followed the radiation dose to staff involved in dental radiography is too low to require the routine use of radiation monitoring dosimeters. Monitoring dosimeters are available however from NRL on a fee-for-service basis.

**Advice on radiation protection matters is available from NRL.**