European Union initiatives in non-ionising radiation

In order to coordinate research into possible effects of exposure to electromagnetic fields, the European Union has initiated a programme under its COST (European Cooperation in the Field of Scientific and Technical Research) framework. Going under the obscure banner of COST 281, the programme was established in 2001 and is supported by most of the EU member states. COST 281 does not fund research, but attempts to bring together researchers and disseminate results so that research across the EU is carried out in a coordinated fashion.

A secondary objective of the programme includes scientific evaluation of the research, and the first of these was published as a "Watchdog Report" at the end of 2002. The review concluded that "there have been no major new studies that justify increased concern about adverse health effects below the recommended exposure limits", but noted the continuing public concerns about cellsites nevertheless. For this reason cellsites were the subject of a special workshop held in May 2003, which investigated them from the points of view of exposure assessment, health effects research, psychological effects and risk communication.

COST 281 maintains a very good website at www.cost281.org from which all meeting and other reports can be downloaded.

The transport of radioactive material – a seminar for carriers and other stakeholders

The transport of radioactive material in New Zealand is subject, through the *Radiation Protection Regulations 1982,* to the requirements of the International Atomic Energy Agency's (IAEA) transport regulations. The National Radiation Laboratory, New Zealand's regulatory authority, encourages representatives of carriers and other stakeholders in the transport of radioactive material to attend a one-day seminar being held in Christchurch and Auckland (if there is sufficient demand a third seminar will be held in Wellington). The seminar is not a training course, rather the intention is to alert and inform policy makers, managers and team leaders to legal responsibilities and best practice. There will be practical exercises and ample opportunity for questions.

The objectives of the seminar are:

- To increase awareness of regulatory requirements and to promote best practice amongst carriers of radioactive material.
- To provide an open forum for questions and discussions.

The seminar is targeted at:

- Managers and team leaders involved with the carriage of radioactive materials and working in any of the following areas: policy, process management, training, health and safety and quality assurance.
- Stakeholders in the transport of radioactive material.

There is no charge for attendance at a seminar. However, a charge of $10 per person is being made to partially offset catering costs.

The seminar will be held at the following venues:

Christchurch: National Radiation Laboratory, 108 Victoria Street, Christchurch
Wednesday, 8 October 2003

Auckland: Ministry of Health, Unisys Building, Level 3, 650 Great South Road, Auckland
Thursday, 4 December 2003

If there is enough demand, a third seminar will be held in Wellington in early 2004.

Places are limited to 20 persons per seminar.
Early application is advised. Contact Cris Ardouin or Tony Cotterill at NRL.
E-mail address: Cris_Ardouin@nrl.moh.govt.nz or Tony_Cotterill@nrl.moh.govt.nz

MINISTRY OF HEALTH
MANATŪ HAUORA

For further information contact: National Radiation Laboratory
PO Box 25-099, Christchurch, N.Z. Phone: (03) 366 5059, Fax: (03) 366 1156
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NRL's Environmental Laboratory achieves certification as a CTBT radionuclide laboratory

The Comprehensive Nuclear-Test-Ban Treaty (CTBT) bans all nuclear explosions, for military and civilian purposes. It is a cornerstone of the international regime on the non-proliferation of nuclear weapons and an essential foundation for the pursuit of nuclear disarmament. New Zealand has signed and ratified the Treaty and is therefore a member of the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organisation (CTBTO). The Preparatory Commission carries out the necessary preparations for the effective implementation of the Treaty. Its main task is the establishment of the International Monitoring System (IMS) and the International Data Centre (IDC).

The IMS network consists of 321 monitoring stations, which are established to record data necessary to verify compliance with the Treaty. The network is supported by 16 radionuclide laboratories around the world. The main role of the radionuclide laboratories is to perform analyses on samples from the IMS radionuclide monitoring stations. The purposes of the analyses are:

- To corroborate the results of the routine analysis of a sample, in particular to confirm the presence of fission products and/or activation products originating from a nuclear explosion.
- To provide more accurate and precise measurements on a sample.

The radionuclide laboratory should be capable of reliably identifying the radionuclides in the sample and determining their activities, and of providing an expert assessment of the properties of the sample.

The Provisional Technical Secretariat (PTS) of the CTBTO assessed the NRL Environmental Laboratory's compliance with certification requirements for the radionuclide laboratories. The purpose of the certification is to provide the state signatories and the Preparatory Commission with confidence that the services provided by the laboratories meet the standards required for the CTBT verification regime. Certification was received after a comprehensive document review, evaluation of the quality of analytical results and a 5-day on-site assessment. As a certified radionuclide laboratory NRL can now fully support the operation of the IMS network and the Preparatory Commission of the CTBTO.

For more information contact Riitta Pilviö (Riitta_Pilvio@nrl.moh.govt.nz).

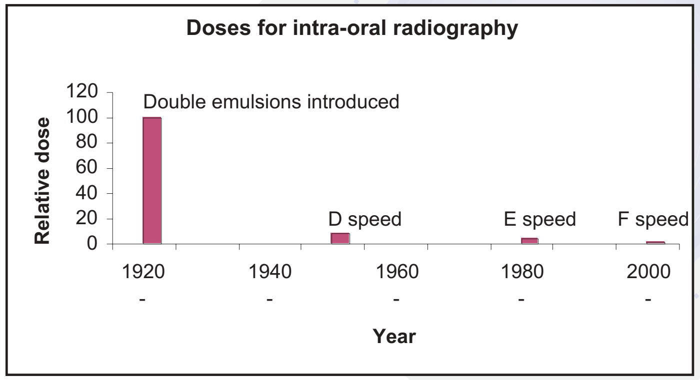
Dental drill: Dental film – a case of speed does not kill

Dental Drill returns in this issue of *The Source* with a discussion of film speed – its impact on patient dose and image quality.

The first dental radiographs were taken only a few weeks after Roentgen announced his discovery of x-rays. These first radiographs used silver halide emulsions to form the image in much the same way as today but, rather than the sub-second exposure times of today, required exposure times as long as 25 minutes! Since then technological advances have occurred at irregular intervals – including, the use of emulsion on both sides of the film base, the development of more sensitive emulsions and advances in the shape and size of the crystals in the emulsion.

A system of classifying the sensitivity of dental x-ray films has been in place for several decades. The sensitivity of a given type of film is a measure of how much radiation is required to produce a given blackening on film – the lower the dose required, the more sensitive is the film. Speed is the term usually used to describe film sensitivity, where A speed film is the slowest (least sensitive), and each new letter indicates an approximate speed increase of a factor of two. Currently available for purchase are the D speed (often called ultra-speed), E speed (ekta-speed or ekta plus) and more recently F speed film.

The D speed film was the "industry standard" for many years, allowing good images to be obtained for reasonably low doses. The initial introduction of E speed film in the 1980s was not entirely successful – while the dose used was lower, there was some loss in image quality, to a point considered unacceptable by many dentists. Technological advances resulted in a new type of E speed film becoming available in the mid 1990s. With these new films, there appears to be no compromise in image quality.



The accompanying diagram illustrates the historical trend in reducing doses for intra-oral radiography. If the dose that would have been used in the early 1900s with the advent of double emulsions is assigned an arbitrary value of 100 units then by the time D speed film was widely available in the 1950s the relative dose was 8 units. E speed film requires about one-half of the D speed dose, while the new F speed film provides a further 20 percent reduction, giving approximate relative doses of 4 and 3 units respectively. It should be noted that to gain the full speed of any film requires the use of optimum film processing.

So what is the relative market share of the various film speeds? Data from our compliance monitoring visits to dentists in New Zealand suggest that the vast majority of dentists still use D speed film. So why has the uptake of E speed film been so low?

There are probably several reasons – the legacy of the poor image quality of the earlier E speed film; cost; and why change a system that is working well. On the last point, to change from D speed to E speed film does mean that the technique factors for an exposure will change. On a few machines this is a simple matter of selecting an exposure time of about one-half of that used with D speed film. However, for many machines, such as those with anatomical selection, an internal adjustment is likely to be required, necessitating the presence of the x-ray service technician.

Radiation protection principles state that if the required image quality can be easily obtained for a lower dose, then that technique should be implemented. Hence the National Radiation Laboratory advocates the use of the fastest film speed that is consistent with the required image quality, and the literature would strongly suggest that current E speed film has proved itself, and F speed film warrants being considered.

For more information contact John Le Heron (John_Le_Heron@nrl.moh.govt.nz).

Incidents involving ionising radiation

A radiation incident may, in broad terms, be thought of as any abnormal or unintended event involving ionising radiation equipment or radioactive materials which results in, or has the potential to result in, an exposure to radiation to any person or the environment outside the range of that normally expected for that situation. Such events could arise from operator error, equipment failure, or the failure of management systems.

This article will discuss why reporting of certain radiation incidents is an important component of radiation safety. In addition, guidance is given on the types of radiation incidents that need to be reported. Future issues of *The Source* will look at the types of major radiation incidents that have occurred worldwide and discuss what lessons can be learnt from them.

Why report radiation incidents?

There are several reasons for reporting radiation incidents. The first is to ensure that the extent of the radiation exposure or potential radiation exposure has been assessed correctly and that appropriate medical management is being provided. Second, to ensure that appropriate remedial actions occur – these might include repair of damaged or malfunctioning radiation equipment; the clean-up of contamination; location of a lost source, or improved security. And thirdly, learning from the incident to prevent or minimise recurrences. This might be via, for example, improved safety procedures, improved operator training, modifications to equipment, changes to radiation safety management or changes to security.

What radiation incidents need to be reported to the NRL?

All radiation incidents need to be reported to the licensee responsible for the use of radiation where the incident occurred. More serious radiation incidents also need to be reported to the NRL – mandatory requirements are given in the *Radiation Protection Regulations 1982* and the appropriate NRL Code.

The following gives more general guidance on what should be reported to NRL:

- any incident that causes or may lead to radiation injuries;
- any incident that causes or may lead to radiation doses exceeding the respective annual dose limits for radiation workers or members of the public;
- any medical exposure where the patient:
    - is administered an activity of radioactive material, for diagnostic purposes, that greatly exceeds normal practice;
    - receives a radiation dose, for therapeutic purposes, that differs from the prescribed dose by more than 10 percent;
    - receives an x-ray dose, for diagnostic purposes, that was substantially greater than intended;
- any therapeutic treatment delivered to either the wrong patient or the wrong tissue, or using the wrong radiopharmaceutical;
- any diagnostic procedure other than as prescribed by the practitioner;
- lost or stolen radioactive sources or irradiating apparatus;
- transport of radioactive material where a package is damaged during freight handling or transport;
- significant unintentional or unauthorised discharges of radioactive materials into the environment;
- significant contamination with, or dispersal of, a radioactive material.

After receiving notification of a radiation incident, the NRL will liaise with the licensee to ensure a satisfactory outcome to the incident.

First point of contact in relation to radiation incidents is Tony Cotterill (Tony_Cotterill@nrl.moh.govt.nz).