Minister of Health signs Test-Ban Monitoring Station Contract

The Minister of Health, Hon Annette King, recently signed a Contract on behalf of the New Zealand Government, acting through the National Radiation Laboratory, for the installation of a further international radionuclide monitoring station, to be located near Nadi, Fiji.

Hon Annette King and Jim Turnbull, Group Manager of NRL, sign the Fiji station CTBT contract

The new radionuclide monitoring station will be the fifth installation undertaken on behalf of the Comprehensive Test-Ban-Treaty Organisation (CTBTO) by the NRL, and the second outside of New Zealand.

This installation is the latest of a series of initiatives undertaken by the NRL in support of the international monitoring network prescribed within the Treaty. It follows recent site survey work undertaken by the NRL in Mauritania (West Africa) and Kiribati. The NRL is presently preparing proposals regarding possible installations of radionuclide stations in these countries.

The NRL has installed and now operates radionuclide stations located at Kaitaia, Chatham Island and Rarotonga, and is about to complete the installation of an infrasound station also located on Chatham Island.

Resources

Items of interest in radiation safety available on the web

The IAEA has released a Draft Code of Conduct for Security of Radioactive Sources (this is one of the documents referred to in our legislation review article on the front cover of this issue). The Draft Code can be viewed at: http://www.iaea.or.at/worldatom/About/Policy/GC/GC47/Documents/gc47-9.pdf

The ICRP has recently issued two new publications. These are ICRP Publication 90: *Biological effects after prenatal irradiation (embryo and fetus)*, and ICRP Publication 91: *A framework for assessing the impact of ionising radiation on non-human species*.

The NRL library has received these in hard copy and they are available through interloan from your library. Alternatively, they can currently be viewed directly through the following internet links (these are very long – sorry, you will have to type carefully!):

ICRP Publication 90:
http://www.sciencedirect.com/science?_ob=GatewayURL&_origin=CONTENTS&_method=citationSearch&_piikey=S0146645303000216&_version=1&md5=75a6d24a3e7c5fc71a45eda780ad6ea6

ICRP Publication 91:
http://www.sciencedirect.com/science?_ob=GatewayURL&_origin=CONTENTS&_method=citationSearch&_piikey=S0146645303000228&_version=1&md5=46ca74d1d25d9321ef239efc8dc2812d

MINISTRY OF HEALTH
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NRL
National Radiation Laboratory

The Source

Issue 14
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A review of the radiation protection legislation

Further progress

Issue 12 (May 2003) of *The Source* gave a progress report on the review of the radiation protection legislation. At that stage submissions had been received on the discussion document that was released in December 2002. The submissions have been analysed and a summary has been published (See http://www.nrl.moh.govt.nz "What's new".)

The discussion document explained the difficulties that arise because the *Radiation Protection Act 1965* licenses individual users rather than the company that uses radiation. There was unanimous agreement among submissions that New Zealand needs new legislation. There were many comments stressing the need in any new system for the degree of regulatory control to be commensurate with the degree of risk being regulated. Many submissions were in favour of the inclusion of some elements of risk management or performance-based regulation so that compliance costs could be optimised at the discretion of the user. There was generally a preference for drafting new legislation following the examples and standards given by international and, where appropriate, Australian models.

One of the proposals discussed was the suggestion that new legislation should include non-ionising radiation (lasers, UV, radio waves, etc) as well as ionising radiation (x-rays, radioactive materials, etc). While there was agreement that ionising radiation should be regulated there was a widely divergent range of opinions on whether non-ionising radiation should be. It is possible that a new Act will enable regulations to be made for some types of hazardous non-ionising radiation that will require compliance with a Code of Safe Practice, or performance standards for particular types of equipment, without necessarily invoking the full licensing regime associated with ionising radiation. These regulations would be developed on a case-by-case basis after a new Act is in force, and with full consultation with the industry. Any regulatory process must take account of the need for the benefit to outweigh the cost.

Following the support from submissions, approval was sought from the Minister of Health to progress towards the drafting of a new Bill. Approval was granted in September 2003, and policy development is underway for a Cabinet paper to form the basis of drafting instructions for the Bill. It is expected that the greatest change from the previous *Radiation Protection Act* will be a move to corporate licences in favour of individual user licences. The policy development is also taking careful consideration of a number of international conventions, such as the *Code of Conduct on the Safety and Security of Radioactive Sources, The Convention on the Physical Protection of Nuclear Material,* and *The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.* These Conventions have not yet been implemented in New Zealand and in each case some strengthening of the radiation protection legislation is required before they can be. It is intended to submit the paper to the Cabinet Social Development Committee before the end of this year.

For more information contact Vere Smyth (Vere_Smyth@nrl.moh.govt.nz).

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NRL is a specialist business unit of the Ministry of Health

Dental drill: What is an acceptable exposure time in intra-oral radiography?

The last few articles in Dental Drill have discussed some of the factors that influence the image quality versus patient dose relationship. A crude "litmus test" for whether a given dental intra-oral x-ray system and film processing is satisfactory is whether the exposure time for an x-ray examination is in an acceptable range.

What does changing the time do?

Intra-oral x-ray units in New Zealand have very few "knobs" or settings that can be changed. The kVp is fixed in most units, as is the mA (tube current), but the exposure time can be varied either directly by selecting the value of the time required or indirectly by selecting the icon or icons (tooth symbol, patient size, etc) required. Changing the time simply changes the number of x-rays being produced – for example, doubling the exposure time doubles the number of x-rays.

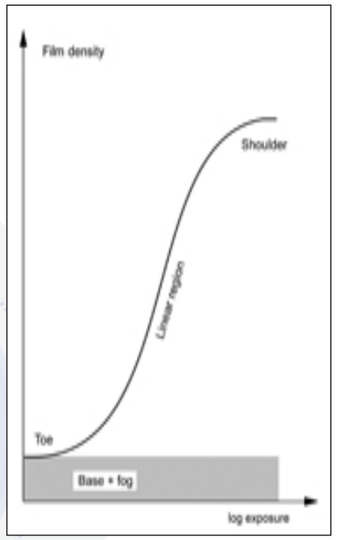
What determines the exposure time needed?

Many factors affect the exposure time needed:

The kVp of the machine, together with its waveform and filtration, determines the penetrating properties of the x-ray beam – the higher the kVp, the more penetrating the beam, and hence the need for fewer incident x-rays. X-ray units operating at 70 kVp should require shorter exposure times than units operating at, say, 50 kVp.

The tube current of an intra-oral x-ray unit is typically in the range of 7 to 15 mA, but the value depends on the specific make and model. The higher the tube current, the higher the x-ray output, and this should mean the shorter the exposure time.

The focus-to-skin distance (discussed in *The Source*, Issue 11) also affects the exposure time required. While a longer focus-to-skin distance (200 mm) is strongly recommended, it can lead to longer exposure times compared with a short focus-to-skin distance (100 mm).



Film speed is another factor influencing exposure time. It would be expected that the use of E or F speed film would result in exposure times about one-half of those for D speed film, all other factors being equal.

The density of the resulting image depends on the number of x-rays reaching the film – the more x-rays, the darker the film. All films have a characteristic curve of similar shape to that shown in the accompanying diagram. The aim with all exposures is to obtain image densities, for the anatomy of interest, that lie in the so-called linear region of the curve. Or to put it another way, images with average densities in either the toe region or the shoulder region are to be avoided if good contrast is to be obtained in the image. There is some latitude within the linear region, and personal preferences often dictate whether images have high or low average optical density. Higher densities do require more radiation and hence longer exposure times.

The final major factor influencing exposure time is the film processing. The importance of processing cannot be over-stated, as discussed in *The Source*, Issue 8. If the processing is not correct, due to spent chemicals, incorrect temperature, incorrect development time or "sight" development, etc, then it is more than likely that lengthened exposure times are being used in an attempt to compensate for the processing deficiencies.

Then there is the practical issue of what timer settings are available for selection. This will depend, in the first instance, on the waveform of the generator and the method of controlling the timing. Single pulse self-rectified units usually have a shortest available exposure time of about 0.1 seconds, while constant potential units may offer exposure times as low as a few milliseconds. Some clockwork timers are still in use, and these typically can set times down to only about one-quarter of a second.

What is an acceptable exposure time?

As a starting premise exposure times should be as short as possible. The main reason for this is to minimise the chance of patient movement during the exposure as any motion will result in loss of sharpness in the image. The NRL *Code of safe practice for the use of x-rays in dentistry, NRL C7*, gives 1 second as the maximum recommended exposure time, but under normal circumstances exposure times for all types of intra-oral radiography should be able to be less than 0.7 seconds for D speed film systems, and less than 0.5 seconds for E speed film systems. Digital systems should be able to use exposures that are less than for E speed systems. The actual value will obviously depend on the interplay of the factors discussed above. As a starting point for a new or changed x-ray system, the x-ray unit's owners manual and film or digital receptor manufacturer should give guidelines for exposure times.

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

Incidents involving ionising radiation

The NRL radiation incident response plan

In the previous issue of *The Source*, we discussed radiation incidents generally – what constitutes one, and when and why they need to be reported to the NRL. In this issue of *The Source*, as part of our series on radiation incidents, we take a brief look at the NRL radiation incident response plan, which has been set up primarily to support emergency services when certain types of radiation incidents occur.

Licensees will, where necessary, have documented processes to deal with all reasonably foreseeable radiation incidents and, in most cases, incidents will require an initial response only from the licensee. However, in some circumstances, incidents will require immediate assistance from the emergency services and/or the NRL. These incidents are most likely to involve transport accidents, fires, or theft/loss of radioactive material. The common theme being that there is an apparent or real danger to persons or property.

As part of the contingency to deal with emergency situations, the NRL now has a formal radiation incident response plan, with support provided by a national network of health protection officers and, in one location, a scientific institute. The plan, which has been previously discussed in Issue 7 (September 2001) and Issue 9 (June 2002) of *The Source*, aims to ensure that in the event of an emergency involving ionising radiation, on-demand expert advice and on-site assistance is reliably and readily available to the emergency services or licensees. The NRL has emergency equipment and an appropriately trained staff member contactable by pager **(contact number 026 102 979)** 24 hours a day, 7 days a week.

The NRL radiation incident response plan should not be seen as in any way removing responsibility from licensees for radiation safety, and licensees should regularly review their own radiation safety planning to ensure that actions to be taken in the event of an emergency situation are documented and well understood.

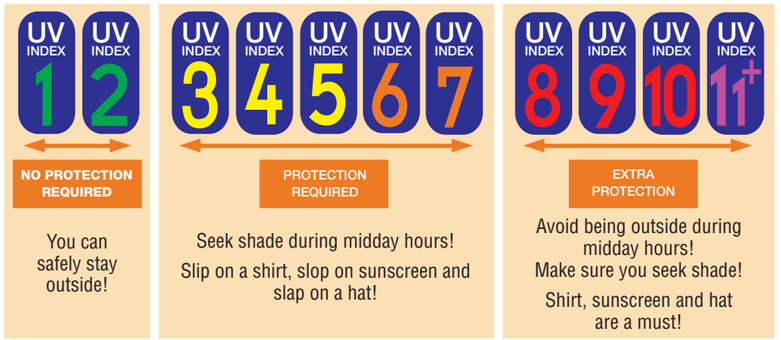
First point of contact in relation to radiation incidents is Tony Cotterill (Tony_Cotterill@nrl.moh.govt.nz).

UV radiation information and NZ Standards

The World Health Organization has recently published a booklet called "Global Solar UV Index, A Practical Guide". This booklet gives useful ideas and strategies for appropriate sun protection messages, in particular targeting children, schools, sports venues and tourist areas.

Reporting burntimes is not recommended by WHO as they can be misinterpreted. They do recommend simple, relevant messages aimed at children and fair-skinned people, who are the most vulnerable population groups. WHO encourages the use of the Global Solar UV Index in reporting and predicting UV levels.

The UV Index illustrated below describes the level of solar UV radiation at ground level. It is intended to be an educational tool which gives uniform sun protection messages, to be used as an integral component of a programme to inform the public about UV radiation health risks and sun protection. Such programmes should be aimed at changing people's attitudes and behaviour with respect to UV radiation exposure.



Copies of the booklet can be obtained from WHO, email: bookorders@who.int, or downloaded from http://www.who.int/peh-uv/Solar_UV_Index_Guide_Final.pdf. Additional information sheets and resources are available at www.who.int/uv/