NRL
National Radiation Laboratory

The Source

Issue 2
June 2000

New initiatives at NRL

Auckland office opened

Since last year NRL has moved to increase the scope of its Compliance Monitoring activities and to strengthen its direct interactions with users of ionising and non-ionising radiations. In recognition of the population base in the greater Auckland area a decision was made to open an office at Wairau Park on the North Shore. While the office currently has a staff of one health physicist, it is likely this will be increased in the near future. Our representative, Mark Dirksen, can be contacted at 09 441 3687, cell phone 025 232 7591, or by e-mail: Mark_Dirksen@nrl.moh.govt.nz

Te Whare Rangahau Puhihi o Aotearoa

The house of New Zealand that seeks the rays of the sun

A decision to post signage at our new Comprehensive Test Ban monitoring stations in both English and Maori has meant that NRL, for the first time in 50 years, needed to find a suitable Maori translation for its name. There were initially some doubts that it would be possible but the end result seems entirely appropriate. Not only does NRL measure ionising radiation, but it has an ultraviolet (UV) detection facility on the roof of its Christchurch building (pictured) and supplies information regarding local UV exposures to both the Ministry of Health and various radio stations during the summer months.

NRL codes of safe practice

During June, licensees using nuclear density meters will receive a copy of a new code, the *Code of safe practice for the use of nuclear density meters, NRL C15*. In a departure from previous codes, this document will only include NRL's mandatory requirements for the safe use of nuclear density meters. Licensees will also receive *Guidance notes*, the first in a new series aimed at giving practical, user-friendly advice on how compliance with radiation protection legislation and the *Code* can be achieved, as well as general safe practice information.

The draft *Code* and *Guidance notes* were sent out to about 150 current licensees for comment, and NRL was pleased to have received many useful submissions on how these documents could be improved.

The veterinary code is currently undergoing revision, and the draft will be sent out to interested parties for comment along with its new companion *Guidance notes* document.

NRL matters

Since *NRL matters no. 1* was issued in December 1998, 7 more have been published primarily to advise licensees of their responsibilities under the *Radiation protection act 1965* and *Radiation protection regulations 1982*, both of which are administered by NRL. They have dealt with topics such as the licensing of various occupational groups (and associated referrals to the Medical Licensing Advisory Committee), charges for disposal of radioactive waste, and transport of radioactive materials by road.

NRL matters no. 8 was published in March to inform anyone buying or selling irradiating apparatus of their legal obligations. It is also available on the NRL web site.

www.nrl.moh.govt.nz

The NRL web site (http://www.nrl.moh.govt.nz), currently hosts over 1000 visitors a month and is updated regularly with items for licensees and others interested in radiation issues in NZ and overseas.

Regular communication with licensees is important to NRL - we welcome feedback.

Safety concerns over laser pointers

Used as presentation aids by speakers and teachers, laser pointers have become increasingly common over the last decade. Their increased availability and use as a cheap novelty item raises the possibility of accidental or deliberate misuse, making them a hazard.

Laser pointers currently available emit a very narrow beam of red light, which diverges only slightly with distance. It can be concentrated into a tiny spot and can cause permanent damage if the laser is shone straight into the eye.

Although the risk of permanent damage from a laser pointer is small, temporary effects are more common. Momentary viewing of the beam from a laser pointer may cause distraction and temporary loss of vision. NRL recommends that only Class 1 or Class 2 laser pointers be used, and that laser pointers should not be given to children as toys.

Further information can be found in NRL Information sheets. IS24 *Safe use of laser pointers* and IS20 *Laser safety*, which gives more detailed information on the laser classification scheme, are available on our web page, or contact Martin Gledhill (Martin_Gledhill@nrl.moh.govt.nz) or Laura-Beth Crane (Laura-Beth_Crane@nrl.moh.govt.nz)

ReSources

Two recent papers by Scientific Director Andrew McEwan include information on public exposures to radiation. *Exposure to ionising radiation* is to be published in the *Public Health Report*. It presents a New Zealand perspective on public, occupational and medical exposures and comparisons with annual dose limits. *Assessment of occupational exposure in New Zealand from personal monitoring records*, is based on data from NRL's personal dosimetry service. It was presented at the Australasian Radiation Protection Society Conference, held in Sydney, 29-31 May. For a copy of either paper contact Andrew McEwan (Andrew_McEwan@nrl.moh.govt.nz). For information on NRL's Personal Dosimetry Service contact either Abby Davis (Abby_Davis@nrl.moh.govt.nz) or Miriam Bugler (Miriam_Bugler@nrl.moh.govt.nz)

Nuclear medicine misadministrations

Regrettably, on rare occasions a patient is referred for a nuclear medicine scan or treatment and a mistake is made in the amount or type of radioactive material that is administered. Every misadministration must be reported to NRL, and its circumstances are investigated. While misadministrations are very rare, they involve an unplanned radiation dose that causes a risk; a legacy that the patient must carry for the rest of their life. There are many steps between the manufacture of a radiopharmaceutical and its administration to a patient. If at some point a mistake is made, history indicates that it is more likely to be through human error rather than a systems failure.

The role of the quality system

In order to comply with the *Code of safe practice for the use of unsealed radioactive materials in medical diagnosis, therapy, and research, NRL C3,* every department must have a quality system. The quality system should detect any errors, using double checks, colour-coding, forms to tick and sign, etc. Usually this is effective, and any errors are picked up and corrected. But in rare cases crucial elements are omitted or checks are done without proper attention and apparently needless mistakes are made, with the *expectation* that nothing is wrong (usually a reasonable expectation). And the mistake persists.

Within the department the typical response to a misadministration is often a loss of self-confidence and the addition of another layer of double-checks or standard procedure forms. But this does not always address the real problem. In most cases the procedures in place at the time probably should have worked. (Of course if the mistake has uncovered a gap in the quality system this must be closed.) Human error is difficult to manage by relying solely on documented procedures, no matter how robust they are, if on-going training issues and the reinforcement of a *quality culture* are not continually addressed.

So what can be done?

Safety and accuracy are both closely related to the *culture* of the department, which is strongly influenced by those in charge and must be nurtured at all levels of operation. Every department must have someone with a personal commitment to quality processes who has responsibility for making sure the system works. The quality system is reviewed by NRL during compliance monitoring inspections, or when an incident is investigated. But this is just a snapshot of the system. It must be maintained within the department by:

- reviewing the system regularly, with feedback from all parties;
- looking for procedures that add nothing to the quality function and are likely to be ignored or passed over (for example, forms that must be signed by a person who is not in a position to know whether or not the information is accurate);
- changing procedures every now and then to prevent staleness (swapping colour-codes is *not* recommended!);
- making sure that all elements of the system are effective and that everyone appreciates the need for them.

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

The *latest* cellphone report

The balance of evidence does not suggest that emissions from mobile phones and their base stations put the health of the UK population at risk, according to a UK Independent Expert Group report on mobile phones and health, published in May 2000. While they found some preliminary evidence of subtle biological effects, they pointed out that this does not necessarily mean that health is affected.

The Group proposed that a precautionary approach be adopted until more scientific evidence becomes available, and recommends further research in a few key areas. It also recommended that children be discouraged from using mobile phones for non-essential calls.

With regard to cellsites, the Group concluded that they cause no general health risks, as exposures were so low.

The UK Independent Expert Group further recommended that more information be made available to mobile phone users to allow them to make informed choices about exposures from their use. This would include the following information:

- that the scientific evidence available suggests that exposure to radiofrequency (RF) fields from mobile phones is highly unlikely to be a cause of adverse health effects on the general population;
- that there is some uncertainty in this, and individuals may therefore wish to minimise their exposures;
- that reductions can be achieved by, for example, making fewer and shorter calls, or using an approved hands-free set;
- that exposure is measured as the specific absorption rate, and information on exposures from different models of phone should be made available.

NRL supports such provision of information

Comparison with the New Zealand situation...

Many of the Group's recommendations, such as adoption of exposure limits recommended by the International Commission on Non-Ionizing Radiation Protection (ICNIRP), and the use of best engineering practice to minimise exposures from transmitters, have already been adopted in New Zealand (NZS 2772.1:1999). Under the Resource Management Act, New Zealand's planning regime also allows for more public input than is currently available in the UK.

...and with other reviews

The Group's conclusions on health effects echo those of previous reviews, such as one published by the Royal Society of Canada in 1999, and the ICNIRP review of 1998. They were also backed up by a statement by the American Cancer Society on 12 May, which commented that "no solid evidence yet exists regarding cellphones and cancer" (www2.cancer.org/zine/dsp_StoryIndex.cfm?sc=001&fn=001_05122000_0).

Hands-free kits - effective or not?

Although the balance of evidence suggests that exposure to RF fields from mobile phones does not cause adverse health effects, some people choose to minimise their exposures by using a *hands-free kit*.

Tests carried out at the UK's National Physical Laboratory and at a specialist testing laboratory, both showed that the kits reduce exposures by at least 80%, even when the earpiece cable is next to the phone's antenna. Although a report published in a UK consumers' magazine in April suggested that the kits increased exposures, it gave few details of how the tests were carried out. The UK Department of Trade and Industry has commissioned further trials, which will be completed in the next few weeks.

Effectiveness of shields?

Shields are also available which claim to reduce exposures. The claims made for such devices should be examined very carefully, to be sure that the conditions under which they were tested realistically represent those of actual use. The UK Expert Group concluded that even the best shields would probably result in very little reduction in exposure.

A simple way to reduce exposure

A very effective means to reduce exposure is simply to use the phone in an area where there is a good signal from the base station (for example, using the phone outside rather than inside, or near a window). In these conditions, the phone automatically reduces its output power - and hence exposures - by a factor of up to one hundred.

For more information visit the NRL website or contact Martin Gledhill (Martin_Gledhill@nrl.moh.govt.nz)

The full report of the UK Independent Expert Group is available on the Internet: www.iegmp.org.uk.

Results of tests of hand-free kits showing large exposure reductions are also available: www.sartest.com and www.newscientist.com/nsplus/insight/phones/stillworried.html

Dental drill

The last issue of *The Source* discussed the question of where to stand when dental x-rays are being taken. This time discussion moves on to consider whether the walls of the dental surgery need to incorporate shielding to ensure people in rooms or areas nearby are not being exposed to unacceptable levels of radiation.

Is shielding in the walls necessary?

The answer to this question is usually no, and is determined by three factors - the number of x-rays being performed, the distances to adjacent rooms and how often these adjacent rooms are occupied. For an x-ray unit being used to take 100 intra-oral films per week, a distance of 3 metres from the patient being x-rayed to a regularly occupied position in an adjoining area gives sufficient protection against the radiation. Levels of scatter from panoramic x-rays are similar to those from intra-oral units.

Do building materials provide shielding from radiation?

In addition to distance, common building materials used for walls provide some radiation protection. For example, gib board used on each side of an internal wall will reduce the transmitted intensity to about one quarter of that incident on the wall, while a concrete block wall reduces the transmitted intensity to only a few percent.

When might extra shielding be required?

Shielding in the walls may be needed if x-ray workloads are high and the distances to occupied places relatively short. In these cases, because the energy of dental x-ray beams is relatively low, a suitable shielding material for walls (and doors if necessary) is sheet steel of 1.6 mm thickness (previously known as “16 gauge”).

If you are unsure about the need for shielding in your particular practice, advice should be obtained from NRL. For practices where extra-oral radiography (other than panoramic) is being performed it is also recommended that advice be sought. Please contact John Le Heron or Peter Cartwright (John_Le_Heron@nrl.moh.govt.nz, Peter_Cartwright@nrl.moh.govt.nz)

Cosmic radiation and air travel

Cosmic radiation is ionising radiation that originates in outer space, and enters the earth through the atmosphere. As the cosmic radiation passes through the earth’s atmosphere it is absorbed, and only low levels are present on the ground. It follows though that the levels of cosmic radiation increase with altitude because of the reduced atmosphere and its shielding effect.

Passenger exposure

Commercial jet planes typically fly at altitudes of up to 12 km, and at this height the levels of cosmic radiation can be up to 30 times those measured on the ground. The exposure to higher levels of cosmic radiation that passengers receive through flying adds to the radiation dose that they receive in a year. A flight to London, for example, results in an exposure similar to 3 chest x-rays. However, we are continuously and unavoidably exposed to natural sources of ionising radiation, including radon, and a flight to London amounts to about only 1/20th of what we typically receive from natural sources in the course of a year anyway and does not in itself pose any risks to health.

Exposure of international aircrew

The situation is different for flight crew who spend a significant amount of time in the air. Under current flying conditions, international aircrew are the New Zealand occupational group most highly exposed to radiation. This situation is well understood by the airlines who factor this into crew rosters and total time spent in the air.

In the case of pregnant aircrew, the recommended limits of exposure of 2 mSv for the duration of the pregnancy would be exceeded by most women if they worked without restriction for the duration of their pregnancy. Airlines have introduced policies regarding the rostering of pregnant aircrew so that their flying time is limited, after which they move to ground duties.

Information sheet no. 19: *The exposure of New Zealand aircrew to cosmic radiation*, is available on our web site or from NRL.

For further information contact: National Radiation Laboratory
PO Box 25-099, Christchurch, NZ. Phone: (03) 366 5059, Fax:: (03) 366 1156
Email: enquiry@nrl.moh.govt.nz, Web page: http://www.nrl.moh.govt.nz