Newsletter of the HPA Personal Dosimetry Service

Monitor

October 2008 Issue 34

Health Protection Agency

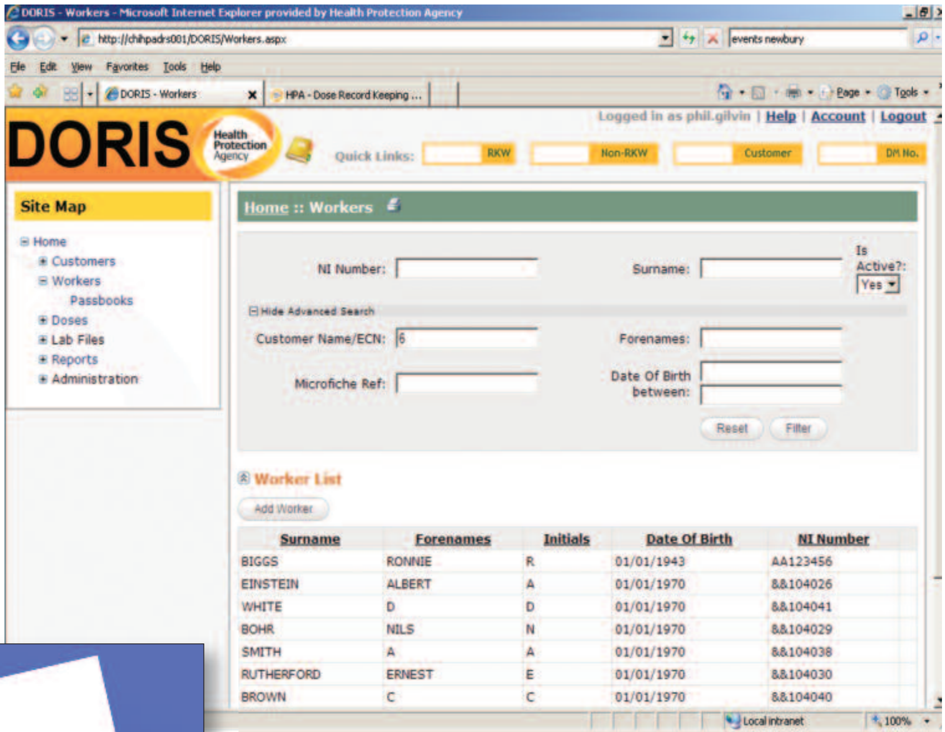
New Database for Dose Reporting & Record Keeping – Update

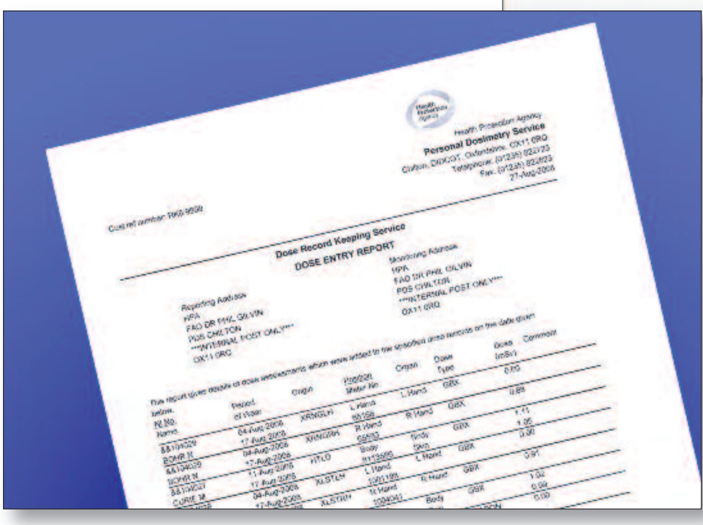
In "Monitor" 33 we reported on plans to replace the database which we use to manage dosemeter issues, dose reporting and dose record keeping. The new system is known as DORIS, which is an acronym for DOsimetry and Records Information System. The main reason for the change is to maintain service reliability, but the new system has the potential for new features to be added in the future. At this stage you should see very few changes to the way our services run. The content of our reports will remain the same, although the style will be slightly different, and doses will be shown in millisieverts (mSv) to two decimal places instead of one.

DORIS has been prepared for us by the software company Tessella Support Services plc, who have wide experience in providing software for scientific and technical applications. The project is proceeding according to plan, and testing is at an advanced stage. At time of writing we are running the new and old systems in parallel, which is both helping us to test the new system and providing comparison data which demonstrates that the new system is working correctly.

All data held on the old database, which covers dose records back to the mid-1970s, is being migrated to the new system, so that when testing is over – currently scheduled for October – we will be able to shut down the old system. At that stage you will start to receive reports in the new style (pictured).

We have taken great care to make sure that every function of the old system is preserved in DORIS, and have covered as much as we can in the testing. We are therefore very confident that the new system will work well, but if you do have any concerns or comments during the transition period please let us know. Contact Phil Gilvin or Nicky Garratt in the first instance (see back page for contact details).





In this issue:

Radiation Dosemeters, Film Badges & TLDs

As readers of this newsletter will know, HPA closed its film badge service in 2007 after over 40 years' operation under HPA and its predecessor organisations, the National Radiological Protection Board (NRPB) and the Radiation Protection Service. Sometimes we're still asked to provide "film badges", but by that, of course, most people just mean a "radiation dosemeter".

For many years the only economic form of radiation dosemeter was the film badge. This was based on photographic film which, when developed, showed darkening in proportion to the dose received. By the 1960s the film badge had become firmly established for measurement of whole-body doses of radiation. When finger, or extremity, dosemeters were developed in the 1970s they were entirely based on the method of thermoluminescence dosimetry (TLD). In this, the energy delivered by the ionising radiation is stored by the sensitive material until it is heated to a few hundred degrees, when the stored energy is released as light (see "Monitor" no. 31). So, by this time, whole-body dosimetry was carried out by film badges, and extremity dosimetry by TLDs. A number of dosimetry services still operate in this way, and indeed all extremity monitoring in the UK is still carried out with TLDs.

The situation for whole-body dosimetry is different. In the 1970s NRPB launched a whole-body dosimetry service using TLDs, and over the next decade some other services also switched to TLD, although film badge usage remained substantial. Since the mid-1990s other methods have also become available, such as optically-stimulated luminescence (OSL) and radio-photo luminescence (RPL). Although these methods use different materials they can be thought of as similar to thermoluminescence, but using light rather than heat to stimulate the release of the stored energy. So, for monitoring of whole body doses from beta, gamma and x-rays, there are a number of different types of radiation dosemeter.

The whole-body radiation dosemeter offered by HPA is of the TLD type. As mentioned in previous issues of "Monitor", the HPA TLD uses a new type of material. This is a variant on the well-established phosphor lithium fluoride, incorporating magnesium, copper and phosphorus dopants, and is so sensitive that it is no longer the dosemeter that determines the dose detection limit, but rather the background radiation that arises from local geology, building materials and cosmic radiation from outer space. The material has a response which does not vary greatly with radiation energy, and is used in a holder consisting of polypropylene with a PTFE filter. This means that the dosemeter is "tissue-equivalent" - in other words, it behaves much like human tissue. Since the aim of personal dosimetry is to measure dose in human tissue, this makes the HPA TLD a very good dosemeter. Because of its tissue-equivalence it will respond correctly to any radiation field, whether a commonly-encountered one or an unusual one: it realises the physical quantity to be measured.

So, if you call our Customer Services office (see back page for contact details) and ask for a film badge, we won't be able to supply you one. But in our TLD, we can supply you with a very good radiation dosemeter instead!

Frequently-Asked Questions

My dose report shows "Approximate" next to a dose result. What does that mean?

We put the note "approximate" in a dose report when the result is subject to a higher measurement uncertainty than usual. Measurement uncertainty arises from a number of causes, including:

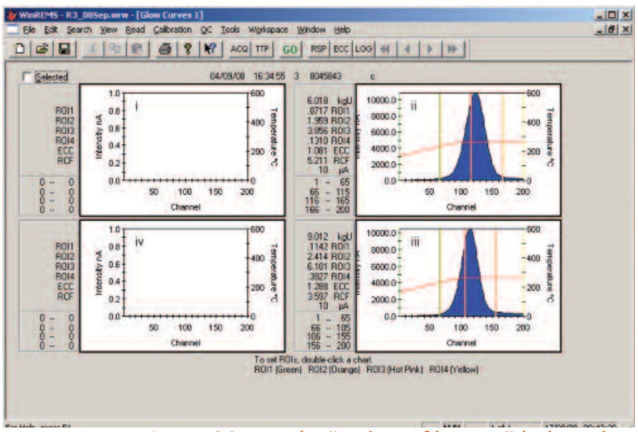
- uncertainty in calibration of the dosemeter;
- uncertainty in calibration of the automatic read equipment;
- variation in response of the dosemeter as radiation energy changes;
- variation in response of the dosemeter with age;
- etc.

All dosimetry systems are subject to uncertainties such as these, and a service such as ours will assess uncertainties during type testing and routine quality control. (For a published peer-reviewed type test of the HPA body TLD, see Gilvin, P J et al: *Type Testing of a New TLD for the UK Health Protection Agency, Radiation Protection Dosimetry* Vol. **128** (2008) 36-42.) Under laboratory test conditions a good dosimetry system such as ours will typically achieve an uncertainty of ±15% at the 95% confidence level (i.e. you can expect 95% of the results to be within 15% of the true dose). However, in operational use the figure will be higher because the radiation field and other conditions are less well known. For our TLD we estimate a total uncertainty of about 30% in operational use.

In some circumstances, though, our measurements are less accurate. These are when:

- our stringent QA tests show that the read-out may not have been normal
- the dosemeter is returned to us for processing very late.

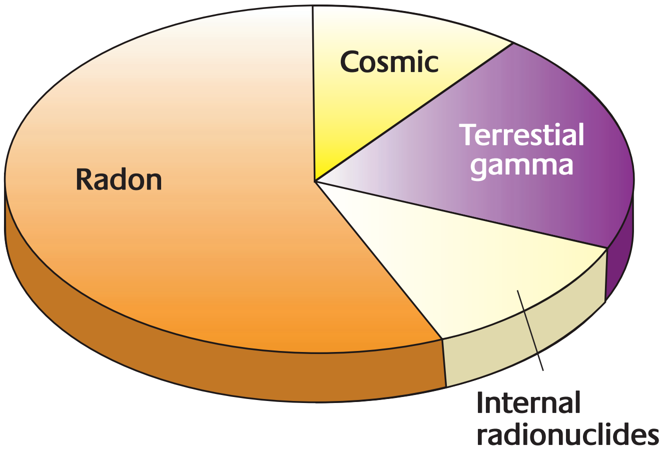
In neither case can we say that the accuracy of the measurement will be as good as usual, so we indicate this with the note "Approx" in the dose report. For most of the "Approximate" results, the uncertainty will still be tolerably low because most of the queried read-outs turn out to be close to normal, and because time effects on the dosemeter are known to be weak. And in worst cases, where the uncertainty is too high we will report no result – instead, we'll write separately and tell you what's happened.



In our QA tests the "regions of interest" (coloured vertical lines) are used to determine whether the TLD glow curve has the right shape.

Natural Background Radiation

It's not just human activities that give rise to radiation exposures. Besides radiation from medical exposures, industrial operations, discharges and so on, everyone in the world is exposed to small amounts of ionising radiation of natural origin.



First, there are naturally-occurring radionuclides in the rocks and soil. These are found most prominently in granite rocks which contain uranium, radium and so on, but in other rocks and soils too. These give rise to radiation exposure of people by a variety of routes. Some penetrating radiation comes directly from the rocks and building materials. Radioactive decay of uranium gives rise to radon gas which seeps out of the ground and concentrates in enclosed buildings; when the radon gas in turn decays it gives rise to radionuclides which can be breathed in, so causing radiation exposure of the lung. Some foodstuffs contain elevated levels of radionuclides owing to their chemistry, and consumption of these foods gives rise to exposure of the digestive system.

Secondly, there is radiation from space. This is in the form of highly energetic streams of particles known as cosmic rays. Cosmic rays come from the sun and from the galactic centre.

Everyone in the world is subject to radiation from doses from these natural sources, and this has been true throughout history. Since the late nineteenth century we have added to these exposures by human activities. Natural background radiation remains of interest to us for two reasons: first, it helps us keep occupational exposures in context; and second, because employers are not responsible for natural background, dosimetry services such as HPA's need to compensate for any natural background so that we are only reporting occupational dose.

The average dose from natural background radiation in the UK is about 2.2 millisieverts (mSv), or 2,200 microsieverts (µSv), but there is considerable variation owing to locality, building type and ventilation, diet and lifestyle. By comparison, the average occupational dose for classified persons is about 1 mSv a year, and the annual whole body dose limit is 20 mSv. Over half of the average dose comes from exposure to radon gas and its decay products, with another 15% coming from foodstuffs. Both of these exposure routes result in intakes of radionuclides, and standard radiation dosemeters do not detect such doses (but there are special dosemeters designed to assess radon exposure). On the other hand, TLDs and other standard whole-body dosemeters do respond to the gamma radiations from building materials and the ground, and to cosmic radiation. On the average, the sum of these two contributions makes up over a quarter of the total exposure, but it can range from 300 to 1400 µSv a year.

In the HPA TLD service we compensate for this by subtracting an amount of dose from what our dosemeters record. What remains after the background is subtracted is the occupational dose – the dose arising from the work activity. We can subtract the right background for your site (please contact us for details) or we can use a representative national value. The subtraction will typically lie between about 50 and 100 µSv for a one-month change interval.

HPA Launches Dental Laser Safety Training Course

When?
Friday 21 November 2008

Where?
HPA Radiation Protection Division, Cookridge, Leeds

How long?
One-day

How much?
£232 including lunch and refreshments

Bookings?
Email: angela.monks@hpa.org.uk or Tel: 0113 2679041

Building on the success of its Medical and Aesthetic Laser Safety Training Course and its extensive contact with dentists, the HPA will in November launch its first laser safety course specifically for dental applications. This one-day course will run at HPA Radiation Protection Division in Cookridge, Leeds on Friday 21 November 2008. The course will address the requirements of the regulations relating to private and voluntary healthcare and the associated national minimum standards.

A representative of the Healthcare Commission will give a personal insight into the inspection process. The course is designed for laser and intense light source users; dentists, nurses and technicians, as well as supervisors and managers.

For more information or to make a booking please see the enclosed brochure; email angela.monks@hpa.org.uk; or telephone 0113 2679041.

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Information to help you

In PDS we are well aware of the importance of keeping in touch with our customers. If you would like to contact us regarding any aspect of our services please see below for contact details.

We hope you find our newsletter informative. As you may have noticed there are sometimes references made to earlier issues of Monitor, for example in this issue we refer to Monitor No 31 & 33. If you would like to obtain a copy of any back issue please contact us using any of the contacts below or alternatively you could download a copy from our web site at www.hpa.org.uk/radiation.

Simply click on 'Radiation Services & Activities' and then 'Personal Dosimetry' and you will reach the page opposite. Click on related information (on the right hand side of page) and you will be presented with a list of earlier newsletters.

There is also a Customer Notice Board on the same web site which provides information on current issues and is updated on a monthly basis; we hope this is useful.

Getting Connected to the HPA Personal Dosimetry Service

Tel: Prefix 01235 (unless*)	
Dr Phil Gilvin, Manager	822757
Lyn Pike, Deputy (Commercial)	822759
Nicky Garratt, Deputy (Technical)	822651
Sean Baker, Laboratory Manager	822756
Dosemeter Logistics Office	822751/822752
Dose Records Office	822722/822723
Laboratories:-	
TLD & Extremity	822756
Neutron (Leeds)*	0113 267 9041
Customer Services (CS)	822726
CS Team (calls are rotated)	

Fax Numbers	
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