Australian Government
Australian Radiation Protection and Nuclear Safety Agency

AUSTRALIAN RADIATION INCIDENT REGISTER (ARIR)

SUMMARY OF RADIATION INCIDENTS: 1 JANUARY TO 31 DECEMBER 2004

The total number of radiation incidents reported to the Register that occurred during the period from 1 January to 31 December 2004 was **85**. A summary of the incidents in each category is given below:

Nuclear Medicine: 33 Incidents

18 incidents involved the wrong scanning agent/radiopharmaceutical being given to the patient. In 8 cases a dispensing error occurred due to wrongly identifying the radiopharmaceutical by either misreading the labels or selecting the wrong syringe or lead pot. In 2 cases the referral was either not checked or was misread. Another 3 cases involved an incorrectly labelled syringe, a wrong radiopharmaceutical being drawn up after complications in locating the vein led to the initial dose being discarded, and the wrong patient being delivered with the correct referral form. In 5 cases the reason for the wrong scanning agent/radiopharmaceutical being given to the patient was not reported. In most of the cases it appears that checking procedures prior to administration of the radiopharmaceutical were inadequate.

6 incidents involved the wrong patient being given the radiopharmaceutical due to mistaken identity. In 4 of these cases the error was due to the wrong patient ID information being put on the request form, in 1 case a syringe prepared for other patients was mistakenly used to administer the radiopharmaceutical, and in the final case two patients had similar names and the same doses were drawn up for both in error. In all cases it appears that checking prior to administration of the radiopharmaceutical was inadequate.

2 incidents involved the wrong dose being delivered. In the first case, a paediatric patient was given a dose of 113 MBq instead of the required 68.4 MBq of technetium-99m DMSA when scales used to weigh the patient, which were calibrated in both kg and lb, were misread as 33 kg instead of 33 lb (15 kg). The additional effective dose was estimated to be 1.3 mSv. In the second case, the wrong dose was provided by the supplier and it was not checked prior to administration. The patient was administered 500 MBq of iodine-131 leading to a dose of 36 mSv instead of the prescribed dose of 14.4 mSv.

2 incidents involved an accidental release of radioactive material into the sewer. In the first case, an iodine-131 ablative treatment patient was undergoing dialysis and the patient's first dialysis volume, containing approximately 1.7 GBq of iodine-131, was inadvertently released from holding tanks to the sewer. In the second case, a blockage in a sewerage pipe from a dedicated toilet to a storage tank caused iodine-131 leakage and contamination through several levels of a building. One staff member received an effective dose estimated at 0.43 mSv, while 8 other staff were estimated to have received effective doses from 0.003 mSv to 0.085 mSv. The spill was cleaned up and contaminated material was placed in storage to decay. The sewerage system was also re-designed to minimise the possibility of future blockages.

2 incidents involved the wrong procedure being undertaken. In the first case, a patient was booked for the wrong procedure and on presentation to the Department was administered 375 MBq of technetium-99m Sestamibi. It was then discovered that the patient had been referred for a stress ECG only. In the second case, the patient was administered 100 MBq

Thallium-201 for a resting heart study. On checking the clinical information the registrar realised that the correct study for the patient's condition was a whole body scan using technetium-99m Sestamibi.

1 incident involved a patient accidentally being given a scan twice. A non-English speaking patient was accidentally given thyroid scans [technetium-99m pertechnetate, 190 MBq] twice within a few days, due to a booking error when staff failed to view previous examinations on a recently implemented electronic system, and the photocopy of the request form on file had been taken prior to the radionuclide scan booking being written on the request.

1 incident involved the administration of an iodine-131 thyroid scan [260 MBq] to a patient later found to have been 6 weeks pregnant at the time of the scan. The effective dose to the fetus was estimated to be 12 mSv.

1 incident involved a patient breastfeeding after being given a scan. A breastfeeding patient, who had been given a lung scan [technetium-99m carbon, 37 MBq and technetium-99m MAA, 185 MBq], was not advised to interrupt breastfeeding for 12 hours because it was not discovered that she was breastfeeding until some hours after the scan. The patient gave her 4 week old infant two breast-feeds resulting in an unplanned effective dose of 1-2 mSv.

Diagnostic Radiology: 16 Incidents

14 incidents involved patients being given unnecessary/unplanned CT scans/radiology examinations due to mistaken identity. In 8 of these cases the wrong patient ID sticker or name had been placed on the X-ray request form. In 3 cases the mistaken identity involved patients with the same or similar surnames, and of the other 3 cases, one involved a verbal instruction leading to the wrong patient being scanned, in the second case a patient without a handband was misidentified, and in the third case no reason for the mistaken identity was specified. Twelve of these incidents involved CT scans or CT plus general radiology procedures, where the unnecessary patient doses ranged from approximately 1 mSv to 16 mSv and two involved general radiology procedures only with doses estimated at 0.5 mSv and 3 mSv. In one of these cases the wrong patient was CT scanned twice due to a technical failure in the first scan, resulting in a total effective dose of approximately 16 mSv.

1 incident involved a CT scan of a patient later found to be pregnant. Prior to the examination, the patient had signed a consent form stating that she was not pregnant, nor was there any chance of her being pregnant. The fetus received a dose estimated at 9 mSv as a result.

1 incident involved a patient receiving a high skin dose. A patient received a high skin dose of approximately 6 Gy during a complex radioscopy procedure.

Radiotherapy: 6 Incidents

3 incidents with linear accelerators involved a geographical miss of the target area. In the first case, a treatment of 20 Gy was to be delivered in 5 fractions. The first fraction was delivered 3 cm away from the intended target. One extra fraction was prescribed to compensate. In the second case, a treatment of 45 Gy was to be delivered in 25 fractions. The first 2 fractions were delivered 16 cm from the intended target due to the radiation therapist offsetting the patient 8 cm superiorly instead of inferiorly. The isocentre was corrected and the treatment continued as prescribed. In the third case, the patient was to receive 30 Gy over 20 fractions. The initial 8 fractions were applied to a volume 4 cm from the intended target. The oncologist prescribed 4 additional exposures to compensate.

1 incident involved a wrong dose (higher than prescribed) delivered using a linear accelerator. A patient was prescribed radiotherapy to the breast of 45 Gy in 25 fractions. At the 9 month post-treatment review there was greater than expected late radiation toxicity and it was discovered that an error in treatment planning had led to the patient receiving 70 Gy in the

25 fractions. A root cause analysis was instigated, other patient treatments reviewed and changes to checking procedures introduced.

1 incident involved a wrong dose (higher than prescribed) delivered using a superficial X-ray therapy unit. A patient was prescribed 10 treatments of 3.6 Gy each. The patient received 4 treatments that were 4 times higher than prescribed due to the operator incorrectly applying an allowance for a 10 cm cone standoff via MUCalc SXR software. No allowance was required. The operator was not sufficiently familiar with the program and the supervisor was not sufficiently thorough in checking. Overall the patient received 57.6 Gy instead of the prescribed 36 Gy.

1 incident involved overlap with a previous treatment causing excess dose to the spinal cord. A patient was to be treated with 16 Gy to the spine; however staff were not aware that there had been a previous treatment at another hospital to the same area of the spinal cord until after the treatment had been completed. This led to a treatment overlap and the patient receiving approximately 60-80 Gy to 2-3 cm of the spinal cord.

High Recorded Dose: 4 Incidents

3 incidents involved unexplained high doses on personal radiation monitors. Unexplained high doses were recorded on the personal radiation monitors of employees at a mining company [4.96 mSv and 6.9 mSv in 2 months], a university [0.17 mSv in 2 months] and an industrial radiography company [6.14 mSv]. In the industrial radiography case, the dose may have occurred when a monitor was left in a toolbox that was later found in the exposure bay. In the other cases investigations did not indicate any reason for the doses.

1 incident involved a high dose on a personal radiation monitor due to the monitor being left in a linear accelerator bunker during a treatment. A Radiation Therapist reported that a high dose of 3.9 mSv recorded on her personal radiation monitor for a two month monitoring period occurred when the monitor fell off and was left inside a linear accelerator bunker during a treatment.

Mining: 3 Incidents

1 incident involved radioactive contamination of potable water at a uranium mine. The potable water at a uranium mine was contaminated by process water used in the mine's operations when an operator opened a valve connecting the water manifold to a hose, which was inadvertently connected to the potable water system. The high pressure in the process water system caused water to flow into the potable water supply system. The potable water system was flushed out and the water quality tested before workers were allowed to return to the mine.

1 incident involved a vehicle leaving a uranium mining site without being cleaned and without a radiation clearance certificate. A contract operator removed a bobcat from a uranium mining site and left it in their yard in an uncleaned state. When the mining company inspected the bobcat they found that it was covered with grey mud, containing partially leached uranium ore, and that it did not have a radiation clearance certificate. The bobcat was taken back to the mine to be cleaned and then returned to the contractor with a radiation clearance certificate.

1 incident involved a vehicle leaving a uranium mining site with a radiation clearance certificate but subsequently found to contain radioactive contamination. A contractor's truck, used by mill personnel, was required to be cleaned and to obtain a radiation clearance certificate before leaving the mine site. A check of the truck at the contactor's yard detected radioactive contamination even though it had been issued with a radiation clearance certificate on that day. The truck was returned to the mine site for cleaning but subsequently failed to obtain a radiation clearance on two occasions despite further washing. The truck was modified to assist the cleaning of internal parts and the tray was sandblasted before radiation clearance was obtained.

PDMG: 3 Incidents

2 incidents involved a portable density/moisture gauge being run over by a road-making vehicle. In one case, while the operator had left the gauge to retrieve something from his car, a compactor reversed over test equipment and clipped the gauge. Only superficial damage to the gauge resulted. In the other case, while the operator was 10 metres away setting up the next measurement location, a grader reversed over the gauge [containing caesium-137, 280 MBq and americium-241/beryllium, 1.4 GBq]. The control rod handle was broken off, but the source rod [caesium-137] was intact and was returned to its shielded position.

1 incident involved the detachment of a neutron source from its mounting. The holding screw had come loose and the source [americium-241/beryllium, 1.48 GBq] was itself loose within the body of the gauge. The gauge was repaired by someone not holding a licence for this purpose and procedures did not follow the radiation protection plan. The estimated dose to the hands of the repairer was 10.2 mSv, the torso 30 µSv and the lens of the eye 12 µSv.

Ultraviolet Radiation Exposure: 3 incidents

All 3 incidents involved overexposure of persons using UV transilluminators. In the first case, two research scientists were overexposed while cutting gel under a continuous UV transilluminator. The transilluminator had no intrinsic shielding and the two operators wore only safety glasses and no additional face shields, both of which are specified in the standard operating procedures. They received temporary skin damage together with effects to the eyes.

In the second case, a PhD student was using a transilluminator to view multiple DNA bands she was excising from a gel. In the latter part she turned the transilluminator to its high setting to increase the UV light fluorescing the samples. She was initially wearing safety glasses and a face shield, but removed the face shield as it was uncomfortable and hindering clear vision. She received minor temporary UV burns to the face. She was assessed by the university health service nurse, but no medical treatment was required.

In the third case, a research staff member of a hospital was operating a UV transilluminator at a wavelength of 312 nm and with the hinged protective cover raised to enable bands in a DNA gel plate to be stabbed. She was wearing protective goggles, a full-face visor and gloves. Because the hinge on the protective cover was at the front of the bench she had to lean over the bench to stab the gel thus allowing UV to irradiate her face and neck under her protective visor. The research staff member had some flaking of the skin but no visible erythema. Her eyes were not exposed due to the wearing of goggles. It was found that the output at 5 mm from the surface of the transilluminator exceeded the NHMRC exposure limit in 1.4 seconds, and at face level the exposure limit was exceeded in less than 30 seconds.

Cabinet X-ray: 2 incidents

1 incident involved the exposure of a personal radiation monitor. A personal radiation monitor was passed through a baggage inspection X-ray unit resulting in a high reading on a personal dose report.

1 incident involved a person deliberately placing themself into a cabinet X-ray unit. A prison employee reported that they had deliberately placed themself on 2 occasions into a cabinet X-ray unit intended for screening inmates' property. Medical assessment and dose assessment were to follow.

Industrial Radiography: 2 incidents

1 incident involved an industrial radiography source that did not return to the gamma camera. A radiography source [iridium-192, 530 GBq] did not return to the gamma camera as the pigtail

and windout cable were not connected correctly, due to a combination of human error and poor lighting. The source remained at the end of the delivery tube. The person carrying out the retrieval procedure was estimated to have received a dose of approximately 2 mSv.

1 incident involved exposure of personnel when an item being radiographed fell over and damaged the delivery tube of an industrial radiography gamma camera. An industrial radiographer and assistant were performing radiography when the item being radiographed fell over and damaged the delivery tube while the source [iridium-192, 370 GBq] was "wound-out". The source could not be returned to its shielded position and operations to return the source to a shielded position resulted in the exposure of 3 personnel. The whole body doses received by the 3 personnel were estimated as 100 µSv, 65 µSV and 125 µSv respectively and the doses recorded on the personal radiation monitoring devices for each person were 0 µSv, 75 µSv and 100 µSv respectively.

Radiation Gauge: 2 incidents

Both incidents involved exposure of personnel working in the vicinity of gauges where the shutters had not been properly isolated. In the first case, 7 maintenance contractors were exposed when they entered a vessel where a level gauge [containing cobalt-60, approximately 3.5 GBq] had not been isolated. One contractor is estimated to have received a dose of 18.6 µSv, while all other doses were between 0.6 and 6 µSv. In the second case, an employee performing routine maintenance on a vessel containing a level gauge [containing caesium-137, 3.4 GBq] noticed that the shutter position indicator was halfway between 'open' and 'closed' on completion of his task. Worst case calculations indicated a possible dose of up to 1 mSv from 4 hours of exposure spread over 4 days.

Radiation Sources Lost: 2 incidents

1 incident involved an industrial X-ray unit [Rigaku 250 EGS3] being lost after it was sent for repair of a blown tube. Some 11 months after sending the unit for repair, the company requested the return of the unit. The company was advised that the unit had been returned the previous month, allegedly still non-functional. The loss of the unit was reported to the police and the regulator.

1 incident involved a sealed ampule of radioactive material at a radionuclide laboratory that could not be found. The ampule, containing 255.9 kBq of americium-241 solution, was inside a plastic container, inside a metal can. It could not be found after a relocation of numerous sources. It remains unaccounted for after an extensive search of the laboratory and associated waste streams.

Transport: 2 incidents

1 incident involved a radiation source that was temporarily lost during transport. A radiation source [caesium-137, 8.3 mCi], used in a density meter associated with well–logging, was lost from a truck during transport to a well site in a remote area. The source was later recovered and found to have broken away from its holder, but the encapsulation remained intact.

1 incident involved a vehicle accident during transport. A borehole logging company driver transporting two sources [cobalt-60, 2.2 GBq and americium-241, 37 GBq] lost control of the vehicle, causing it to roll several times. The driver had only minor injuries and the sources and shielded containers were in place and undamaged.

Borehole Logging: 1 incident

While a borehole logging source [containing caesium-137, 5.5 GBq] was being winched from a borehole the cable sheared causing the source to fall 61 metres to the bottom of the hole. A

retrieval tool was manufactured and the source successfully retrieved. The source holder appeared undamaged, but would undergo a leakage test.

Consumer Products: 1 incident

A child bit a "Glowring" keyring [containing tritium gas, 17 GBq] purchased over the internet, releasing the tritium gas. The worst case estimated effective dose was 53 µSv (i.e. if all of the activity had been inhaled).

Contamination: 1 incident

A shipment of door handles in air cargo bound for USA was detected by Customs to be radioactive. The shipment had originated from India. 67 of the 694 handles in the original shipment were found to be radioactive (est. 700 Bq/g).

External Exposure: 1 incident

Two people suspected they had been exposed to radiation when they opened a container that included a nickel-63 source.

Laser: 1 incident

A scrub nurse in a hospital was accidentally exposed to a Class 4 laser while wiping the lens, when another person depressed the footswitch, leading to a momentary exposure of the nurse's thumb. The laser had not been placed in standby mode.

Luminising/Luminous Device: 1 incident

A fuel hose and paradrogue, a funnel-shaped device at the end of the hose of a tanker aircraft, fell off an air-to-air tanker whist refuelling an aircraft. There were beta lights at the end of the paradrogue, which were retrieved intact from a rural field. There was no damage to the beta lights hence there was no further risk to people handling the components.

Theft of Sources: 1 incident

A person stole a safe containing various radioactive sources from a university physics store room. The safe was later recovered and all radioactive material was found to be still present and accounted for.