THE ANNUAL REPORT OF

THE RADIATION ADVISORY COMMITTEE

FOR THE YEAR ENDING SEPTEMBER 2004

RADIATION ADVISORY COMMITTEE
Melbourne, Australia

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Hon Bronwyn Pike MP
Minister for Health

Dear Minister

Pursuant to Section 108AK(10) of the *Health Act 1958*, the Radiation Advisory Committee submits the 2004 annual report of the Committee for presentation to Parliament.

Yours faithfully

B M Tress
(Professor)
Chairman
RADIATION ADVISORY COMMITTEE

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RADIATION ADVISORY COMMITTEE

The term of appointment of the present Committee is for a period of three years from 1 June 2002 to 31 May 2005.

COMPOSITION

The Radiation Advisory Committee met on 11 occasions from October 2003 to September 2004. The members of the Radiation Advisory Committee during this period were:

CHAIRMAN
Professor Brian M. Tress
Department of Radiology
University of Melbourne
Meetings Attended: 7

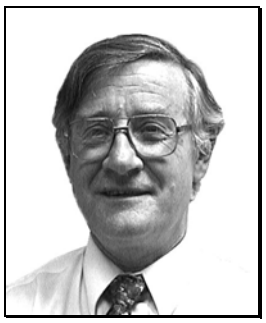
Dr. Geza Benke
Research Fellow
Dept of Epidemiology & Preventive Medicine
Monash Medical School
Meetings Attended: 7

Dr. David Bernshaw
Consultant Radiation Oncologist
Peter MacCallum Cancer Institute
Meetings Attended: 9

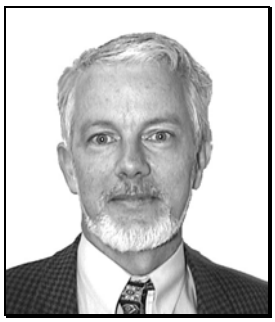
Mr. Philip Brough
Chief Medical Imaging Technologist
Department of Medical Imaging
Geelong Hospital
Meetings Attended: 8

Mr. Peter Burns
Director
Environmental and Radiation Health Branch
ARPANSA
Meetings Attended: 8

Ms. Christy Fejer
Manager, Information and Education
WorkSafe Victoria
Meetings Attended: 8



Dr. John Heggie
Director
Department of Medical
Engineering and Physics
St. Vincent's Hospital
Meetings Attended: 11



Dr. Michael Kelly
Director of Nuclear Medicine
Alfred Hospital
Meetings Attended: 9

Dr. Paul Van Buynder
Senior Medical Adviser
Social & Environmental Health
Department of Human Services
Meetings Attended: 4

Dr. Ken Joyner
Director
Global EME Strategy & Regulatory Affairs
Motorola Australia Pty Limited
Meetings Attended: 8

SECRETARY
Ms Caroline Isakow
Radiation Safety Program
Department of Human Services

RESPONSIBILITIES

The Radiation Advisory Committee was established by the Minister for Health under the *Health Act 1958* to advise the Minister or the Secretary on any matters relating to the administration of the radiation legislation referred to it by the Minister or the Secretary including the following:

(a) the promotion of radiation safety procedures and practices;

(b) recommending the criteria for the licensing of persons and the qualifications, training or experience required for licensing;

(c) recommending the criteria for the registration of radiation apparatus and sealed radioactive sources;

(d) recommending research projects involving the irradiation of human volunteers for approval;

(e) recommending the nature, extent and frequency of periodic safety assessments of radiation apparatus and sealed radioactive sources;

(f) codes of practice with respect to particular radioactive substances and uses of ionising and non-ionising radiation; and

(g) any matter which the Minister agrees the Committee should consider and report on.

1. INTRODUCTION

The Committee accepted, with regret, the resignation of Dr. Paul Van Buynder who had accepted a position with the Western Australian Health Department. The Chairman on behalf of the Committee, thanked Dr. Van Buynder for his involvement and participation over his time with the Committee and noted that his input into RAC matters would be sorely missed.

Throughout the year a number of issues were considered by the Committee including:

- the licensing requirements of various occupational groups;
- new ionising apparatus;
- a review of the National draft Code of Practice dealing with the exposure of human volunteers to ionising radiation;
- the monitoring of NORM contaminated equipment;
- non-ionising radiation matters; and
- a variety of research projects involving the irradiation of human volunteers.

Regarding the review of research projects involving the exposure of volunteers to radiation, this occupies a considerable amount of the Committee's time and effort. The Committee believes that the process used by the Department to approve research projects is warranted, as it is important that the radiation detriment from any project can be justified when compared with the benefits and outcomes from that project.

The Committee was pleased with the work of the Department of Human Services in preparing the discussion paper entitled '*Review of Victorian Radiation Safety Legislation Discussion Paper*'. The Committee felt it was important to prepare a response to the Department of Human Services based on their responsibilities to government. As such, the Committee, and in particular a working group formed from the Committee, spent considerable time and effort in preparing a response. The Committee was of the belief that the outcomes of this review along with the push to have national uniform radiation safety legislation should lead to a clear and consistent approach to radiation use within Victoria.

As with previous years, non-ionising radiation issues still concern the public. The possible health effects of exposure to electromagnetic fields, mobile phones radiation and such sources were considered by the Committee over the past year. There has been insufficient evidence to alter the Committee's view on possible health effects.

The past year has seen the departure of Mr Sergio Costantin from the Radiation Safety Program. The Committee would like to thank Mr Costantin for his assistance with Committee issues, particularly in the area of industrial applications and assistance in the preparation of previous annual reports. The Committee also thanks the staff of the Radiation Safety Program, particularly Caroline Isakow who provided the secretarial support to the Committee.

2. IONISING RADIATIONS

2.1 Audit of Nuclear Medicine Practices

The Committee received a progress report from the Radiation Safety Program regarding the proposed survey of nuclear medicine facilities throughout Victoria. In addition, the Radiation Safety Program sought the Committee's views as to the content of the draft of the survey questionnaire and the proposed initial distribution to a limited number of nuclear medicine sites. A number of improvements and changes to the questionnaire were suggested by the Committee and agreed that it should be sent to a limited number of sites in order for the questionnaire to be properly evaluated prior to being distributed to all nuclear medicine facilities.

2.2 Modification to Model Risk Statement

The Committee was provided with a request from a hospital's human research ethics committee to modify the model risk statement used in participant information sheets for research involving human volunteers. The request suggested that the model risk statement be simplified; the human research ethics committee had supplied an example of the simplified version. The Committee noted key differences with the current risk statement and the simplified version offered by the human research ethics committee. The Committee was sympathetic to the concerns, however, was reluctant to adopt the changes as it felt that volunteers should be given as much information as possible in order to give consent to participate in research.

2.3 General Practitioner Licensing

The Committee was provided with an update of the current licensing status and training issues for General Practitioners. This information included the number of general practitioners currently licensed to perform basic plain film radiography in Victoria. In terms of training, the Committee was reminded of previous RAC recommendations, which included:

- Attendance at an approved course should be made a compulsory prerequisite for licensing; and
- Where the general practitioner can demonstrate hardship in attending an approved course and demonstrate that radiography services would suffer in their local area a conditional licence could be granted. These licences are issued only upon evidence that basic instructions in radiography had been obtained and that the licensee must complete an approved course within 12 months.

The Radiation Safety Program provided information that indicated that there exist a number of general practitioners that have been issued with a licence with a requirement to complete a course within 12 months of the licence being issued. Some of these licences had been issued more than 12 months ago and therefore the licensee had not abided by their conditions of licence.

The Committee agreed with the views expressed by the Radiation Safety Program that the general practitioners must be notified and informed that an approved course must still be undertaken. Licences should not be reissued unless an approved course has been completed.

In terms of issuing new licences to general practitioners the Committee considered that the present arrangement was still the preferred option.

The basis for this approach was that the Committee deemed it unreasonable that patients should have to travel large distances to have basic radiography performed when a local general practitioner could adequately perform the radiography but has been denied a licence due to the unavailability of a course. General practitioners in this situation should be able to attend their local base hospital and obtain some structured training. This training would be given by the chief medical imaging technologist and allow for the general practitioner to obtain a 'provisional' licence that would not be reissued unless the general practitioner completes an approved training course within the duration of the licence. Finally, it was recommended that any changes in the licensing policies by the Radiation Safety Program should be conducted in consultation with the Victorian College of General Practitioners.

2.4 General Practitioner Training and Supervision

The Committee was informed of the concerns expressed by a training facility concerning the workbook assessment process and a proposal for improved supervision of general practitioners undertaking limited plain film radiography.

The current course content offered by this training facility comprises a modularised training manual, a structured practical training workshop and a practical radiography workbook appraisal. The training facility had written to the Radiation Safety Program indicating that following assessment of workbooks and analysis of the reject rates, the facility had reached a conclusion that the course falls short in providing general practitioners with long term radiographic support.

As such the following proposals were being proposed:

- That the granting of a licence following successful completion of the course be contingent upon general practitioners being linked with the nearest Rural/Regional Radiology Department for the provision of radiographic support;
- The linkage is appropriately monitored by the Chief Radiographer and the training facility who will then provide the Radiation Safety Program with an annual report concerning the quality of the delivery of radiographic services by general practitioners; and
- That all general practitioner licences be limited to three years with the granting of a continuation of the licence contingent upon evidence of a professional interaction with the designated Rural/Regional Chief Radiographer.

The Committee agreed with these proposals in principle and suggested that the Radiation Safety Program should further explore the options available for general practitioner training with the training facility. The Committee also recommended that prior to any changes in training policies the Radiation Safety Program should include the Victorian College of General Practitioners in any discussions. Finally, the Committee requested that they be kept informed of any new developments regarding this matter.

2.5 Clearance Method for NORM Contaminated Pipes

The Radiation Safety Program sought the endorsement from the Committee for a company's proposed method for the determination of clearance levels of NORM contaminated pipes destined for smelting. NORM contamination occurred as a result of oil and gas operations in Bass Strait. The Committee was informed that further work had been conducted and approval had been sought from the Radiation Safety Program for a modified measurement procedure. The new measurement method provided the same level of accuracy as the already approved method but allowed pipes to be scanned at a quicker rate. The Radiation Safety Program had indicated that they were satisfied with the proposal, in that it represented an acceptable solution for the disposal of the accumulated stockpile of NORM-contaminated pipes currently being held. As such, the Committee endorsed the process of the measurement of this NORM.

2.6 Supervision guidelines for radiography and nuclear medicine technology students, interns and professional development year trainees.

The Committee was provided with the revised copy of the document entitled: "Guidelines regarding radiography and nuclear medicine technology students, interns and professional development year trainees" for their consideration.

The Committee was reminded that a similar document had been presented to the RAC for consideration some years prior and for reasons unbeknown this document was never made public. Recent concerns raised with the Radiation Safety Program regarding the supervision of undergraduates, PDY's and interns has prompted the Program to revisit this document with the intention of circulating it to the wider medical radiation community. This document had also been forwarded to the Medical Radiation Technologists Board (MRTB) for their consideration. The MRTB had requested that the recommended staffing ratios for the respective professions be included in this document. The Committee endorsed this inclusion. The Committee requested that a final version of this document be brought back to the Committee prior to it being publicly released.

2.7 Administration/distribution of Prussian Blue/DTPA/Potassium Iodide following the release of a dirty bomb

The Committee's advice was sought for the administration/distribution of Prussian blue/DTPA/potassium iodide following the release of a dirty bomb. The Committee was informed that the Federal Government had allocated funding for the formation of a National stockpile of pharmaceuticals, vaccines and prophylactics for a national response to CBR incidents. As such, the Federal Government was considering the purchase of Prussian blue, potassium iodide and calcium-DTPA and zinc-DTPA and had consequently been exploring the options of making these available in the event of a dirty bomb being released.

2.8 Dental Volumetric Tomography- Morita 3D Accuitomo X-Ray unit

The Radiation Safety Program provided the Committee with information concerning a new type of dental OPG/CT scanner, the Morita 3D Accuitomo x-ray unit, provided by a sales company wishing to import it and sell it in Victoria. The Morita 3D Accuitomo is a dedicated dento-maxillofacial, digital, volumetric and tomography scanner.

The Morita 3D Accuitomo x-ray unit is a cone beam X-ray imaging system that requires a 360-degree rotational X-ray sequence to produce diagnostic images of the head and neck. The radiation field is limited to a height of 29mm and a width of 38mm at the centre of rotation. The device generates 3-D images, which enables precise diagnosis of the dento-maxillofacial region. The x-ray unit is based on a similar technique used by traditional CT however with significantly less radiation dose. The Morita 3D Accuitomo is also capable of operating in fluoroscopic mode, which is used with contrast for surgery of the TM joint. There are three fluoroscopic modes that can be selected on the unit: a fluoroscopic moving image mode, a still image mode and a testing mode. The sales company had indicated that most dental specialists would have no use for the fluoroscopy component and that this option can be disabled in the factory.

The Committee believed that the use of this diagnostic tool was justified subject to the fluoroscopy mode being disabled and training being provided to purchasers on the correct use of this equipment. The Committee therefore recommended to the Radiation Safety Program that the unit be approved for sale in Victoria.

2.9
Effect of low doses of ionising radiation in infancy on cognitive function in adulthood: Swedish population based cohort study

The Committee was provided with a scientific article entitled: '*Effect of low doses of ionising radiation in infancy on cognitive function in adulthood: Swedish population based cohort study*' that had been published in the British Medical Journal (BMJ) - 2004; 328:19 (3 January 2004). The Committee noted that the article had investigated cognitive function in adulthood following exposure to low doses of ionising radiation in infancy.

2.10
Request from a vascular surgeon for an exemption from having a medical imaging technologist in attendance for vascular procedures.

An application was received from a vascular surgeon, requesting approval to perform angiograms and angioplasties using a mobile image intensifier without a radiographer in attendance. It was claimed that the interventionist at the tableside could operate this equipment; hence the need for a radiographer would be eliminated. Furthermore, the mobile image intensifier is designed to be operated solely by the specialist; fluoroscopy time, frame-rates and collimation are controlled tableside; the equipment automatically controls dose-rates depending on patient size. Additionally, it was claimed that a medical imaging technologist (MIT) actually slows down proceedings because the operator is able to perform all the functions immediately, rather than directing a MIT.

It was the opinion of the Committee that a radiographer should be in attendance to assist with these types of procedures. The rationale for this approach is that it requires more work and effort to manoeuvre a mobile image intensifier compared to a fixed fluoroscopic unit. In addition, the image intensifier controls are typically positioned on the other side to that of the surgeon and hence would make it difficult to operate the mobile image intensifier without assistance. Finally, procedures are quite complex in nature, surgeons are normally scrubbed and gowned and therefore unable to easily move the equipment whilst also carrying out surgical procedures on patients.

Lastly, the Committee had also queried if the GE/OEC 9800 image intensifier was actually the most appropriate fluoroscopic x-ray equipment to be used. As such, the Committee considered that the preference should be to perform these types of procedures using x-ray equipment dedicated for conducting angiograms and angioplasties and with a medical imaging technologist in attendance. Hence the request was denied.

2.11 Exposure of Human Subjects to Ionising Radiation for Medical Research Purposes

The public discussion version of the draft Code of Practice for 'Exposure of Human Subjects to Ionizing Radiation for Medical Research Purposes' developed by ARPANSA was presented to the Committee for information and comment. The Committee noted that the contents of this draft Code would directly impact on the regulatory functions of the Radiation Safety Program and to a lesser extent the Radiation Advisory Committee. Accordingly, the Committee assisted the Radiation Safety Program in preparing a response to inform ARPANSA via the public discussion process of both the Radiation Safety Program and Committee's concerns with the contents of this draft Code.

2.12 Review of Victorian radiation safety legislation - Discussion paper

The public discussion paper prepared by the Department of Human Services entitled '*Review of Victorian Radiation Safety Legislation Discussion Paper (December 2003)*' was presented to the Committee for their consideration. It was the view of the Committee that based on their responsibilities to government it was important that a submission be prepared and submitted to the Department. As such, a small working group of the Committee was formed to review the discussion paper and formulate a response on behalf of the Committee.

2.13 Licensing of Veterinary Nurses to Operate X-Ray Equipment

The Committee was requested by the Radiation Safety Program to review the training and licensing requirements for veterinary nurses to operate plain radiography x-ray equipment in Victoria. The Committee was informed that the Radiation Safety Program had received documentation from The Veterinary Nurses Council of Australia querying the legalities of veterinary nurses obtaining operator licences to operate plain radiography x-ray units in Victoria. The current Victorian policy is to only grant operator licences to appropriately registered veterinarians to perform veterinary radiography procedures.

In support of their submission the Veterinary Nurses Council of Australia provided the Radiation Safety Program with copies of Draft Competency Standards For Veterinary Nurses, Veterinary Nursing Training Package (VNTP) and with various training and resource material. The Committee was also was provided with a summary of licensing criteria and status of veterinary nurses in other States and an interim viewpoint from the Veterinary Practitioners Registration Board of Victoria VPRB (Vic) and the Australian Veterinary Association's stance on this matter.

It was the Committee's view that the training notes seemed to cover most aspects regarding the theory related to the safe operation of x-ray equipment. The Committee, however, did have some reservations with the contents and recommended that the notes be revised. In addition, the Committee generally had no objection to recommending that the Department licence veterinary nurses, however they indicated that they would defer making a final decision until a final submission is received from the VPRB (Vic).

The Committee requested that the VPRB (Vic) examine the VNTP offered by the Australian Veterinary Nurse Resource Centre (AVNRC) and inform the Committee if following the successful completion of this course veterinary nurses would have the necessary skills and competency to carry out plain radiological examinations unassisted. The Committee also requested advice as to whether the VNTP is broadly comparable to the level of training received by veterinarian surgeons in their undergraduate course in relation to the safe operation of veterinary x-ray equipment.

2.14 Licence application from a theatre technician to operate a 'mini' C-arm image intensifier for orthopaedic procedures

The Committee was informed that the Radiation Safety Program received correspondence from a theatre technician requesting the legalities of an operator's licence to operate a 'mini' c-arm image intensifier for orthopaedic procedures being obtained.

It was indicated that the theatre technician presently sets up the mini C-arm mobile image intensifier for licensed orthopaedic surgeons, but does not operate it. It was claimed that it would be advantageous for a licence to be issued to operate the equipment since on rare occasions unlicensed orthopaedic surgeons would frequent the hospital after hours. Currently for these situations, a radiographer is called to operate the equipment. The Committee noted that no formal training to operate the mini C-arm mobile image intensifier had been obtained by the theatre technician.

The Committee was of the view that mini C-arm image intensifier equipment should only be operated by either appropriately trained and licensed orthopaedic surgeons or registered medical imaging technologists. Accordingly, the Committee recommended to the Radiation Safety Program that the application for a licence should not be issued.

2.15 Licensing of physicists involved in the operation of brachytherapy after loaders and x-ray therapy devices

The Radiation Safety Program sought the views of the Committee regarding the licensing aspects of radiotherapy physicists involved with brachytherapy and x-ray intra-operative therapy programs at radiotherapy sites throughout Victoria. The Radiation Safety Program had received a number of inquiries from radiotherapy physicists concerned with the current licensing arrangements.

The Committee was informed that the Radiation Safety Program had been advised that physicists are required to operate the x-ray intra-operative therapy devices unit as part of the clinical treatment of the patient and also retract and replace brachytherapy sources in clinical applications. It had been claimed by the radiotherapy physicists that use of brachytherapy sources in clinical applications is a recognised role identified by their professional society, the ACPSEM. The current licensing conditions allow radiotherapy physicists to operate these devices for "safety testing of radiation apparatus" only.

The Committee was provided with a summary of other State licensing requirements and conditions. In their deliberation, the Committee indicated that their preference was for the Radiation Safety Program to implement the New South Wales two-tier approach for the licensing of radiotherapy physicists.

The Committee requested that prior to introducing any new licensing conditions the Radiation Safety Program convene a meeting between the users of brachytherapy and x-ray intra-operative therapy devices throughout Victoria to determine the impact on the user

group. Following this meeting a set of conditions was presented to the Committee.

The Committee considered that these conditions were appropriate and had no objection to their introduction. The Committee also noted that by introducing these conditions it would require an accredited Radiation Oncology Medical Physicist to be present at each site performing brachytherapy. The Committee did recommend that prior to rolling out these new conditions the Radiation Safety Program should consult with all radiotherapy sites to ensure that these conditions do not interfere with their current work practices.

Finally, the Committee requested that they be kept informed of the outcome of any meetings held between the user groups and the Radiation Safety Program.

2.16 Application for licence to use DEXA equipment for clinical procedures by a State Enrolled Nurse

The Radiation Safety Program sought the views of the Committee regarding the licensing of nurses to perform clinical DEXA examinations using dedicated DEXA equipment. The Radiation Safety Program had received an application for a licence from a State Enrolled Nurse (Division 2) who had worked in the UK for the last six years in the field of radiography and has queried the legalities of obtaining an operator's licence to operate DEXA equipment in Victoria.

Specifically in reference to the application received by the Radiation Safety Program, the Committee indicated that there was insufficient information supplied in order for them to ascertain whether the applicant possessed a sufficient level of knowledge and competency to operate a DEXA unit. As such, they believed that a licence should not be issued to her until further information was supplied regarding the exact nature of the training received and in what circumstances the DEXA equipment in the UK was used.

Generally, the Committee did indicate that if a suitable course was available for nurses to complete successfully, then they would have no objection in the Radiation Safety Program granting a licence.

The Committee suggested that the Radiation Safety Program should investigate whether any post graduate courses exist for professional groups, other than medical imaging and nuclear medicine technologists, to undertake in Australia.

Finally, the Committee indicated that the MRTB and the AIR should also be consulted in relation to professional groups other than Medical Imaging Technologists and Nuclear Medicine Technologists being issued licences to operate DEXA equipment for clinical purposes.

2.17 Training Course and Exam for Industrial Radiography Licence

The Radiation Safety Program sought the endorsement of the RAC to have a training and examination package approved as an alternative to the Radiation Safety Program exam as a prerequisite for obtaining an operator licence to use ionising apparatus for industrial radiography applications.

The Committee was informed that presently applicants requiring an operator licence to practise industrial radiography must study a set of training notes provided by the Radiation Safety Program and the ARPANSA Code of practice for the safe use of industrial radiography equipment (1989). The applicant must achieve a 60% pass mark in an "open book" exam administered by the Radiation Safety Program in order for a licence to be issued.

The Radiation Safety Program had been approached by a company seeking approval to carry out training and examinations which would qualify students for a Victorian operator licence to conduct industrial radiography. The Radiation Safety Program

considered that the training package gives a good grounding in the principles and procedures needed as an industrial radiographer. The applicant is assessed via a "closed book" exam; the pass mark is set at 70%.

The Committee concurred with the views of the Radiation Safety Program and hence gave approval in principle to have the training and examination package recognised as an alternative to the Radiation Safety Program exam.

2.18 Use of Fluoroscopic X-ray equipment by Veterinary Surgeons

The Radiation Safety Program sought the views of the Committee regarding the licensing of veterinary surgeons to operate a fluoroscopic x-ray unit. The Radiation Safety Program had received an application for a licence from a veterinarian who had gained 3 years experience in the use of fluoroscopy equipment in the USA. The veterinarian did not possess any formal qualifications in the use of fluoroscopy equipment as training had been obtained 'on the job'.

The Committee re-affirmed earlier decisions that because fluoroscopic equipment has the potential to be more hazardous than radiography equipment and that procedures involving fluoroscopic equipment are more complex, veterinarians applying for a licence to use fluoroscopic equipment are required to have appropriate training relating to the safe use of fluoroscopic equipment. This training should ideally be offered by a recognised (accredited) training facility. A specialist in veterinary radiology should provide the training relating to the proposed veterinary fluoroscopy procedures. In the absence of an either accredited training facility or a specialist in veterinary radiology the training should be offered by a person with a physics/radiation protection background.

The Committee considered it worthwhile that the Radiation Safety Program opens a dialogue with veterinary training facilities to determine if this type of training could be added to undergraduate courses.

2.19 Radiation Incidents

Reported incidents involving radiation are infrequent and rarely pose a major health risk to the individuals involved. Regulation 36 of the *Health (Radiation Safety) Regulations 1994* requires that the Department be notified in writing within five working days of any abnormal or unplanned exposure to radiation. Following investigation, incidents of this nature are reported to the Radiation Advisory Committee for information and further advice.

The Committee was advised of six radiation incidents during the year. Two of these incidents involved the maladministration of a radiopharmaceutical, while the remaining resulted from unintended CT scan procedures.

The incidents occurred at a number of different Victorian clinical centres and in a majority of cases the radiation incident was attributed to either practitioner or technologist error.

The Committee was encouraged to see the number of reported incidents decrease from the previous year. The Committee encourages thorough reporting and investigation since this provides a forum for improving work practices.

When compared to the number of nuclear medicine and CT procedures conducted in Victoria each year, the number of reported incidents is very small and in line with international benchmarks. Finally, in each of the incidents the risk to the patient from the unintended radiation exposure was very low.

Theft of a safe containing radioactive material

The Committee was informed that in July a safe containing radioactive material had been stolen from a Victorian University. The Police were notified of the theft and a request for information from any member of the public who knew of the whereabouts of the safe was requested. Media alerts had also been issued by Department of Human Services. The safe was found 3 days later on the grounds of the University. The radioactive material that had been stored in the safe was accounted for and still present.

2.20 Research Projects Involving Human Volunteers

During the year the Committee reviewed 59 new or continuing research projects. Research involving exposure of human volunteers to ionising radiation requires approval from both the institution's ethics committee and the Department of Human Services.

Each project was reviewed in some detail in respect to the NHMRC document *Administration of Ionizing Radiation to Human Subjects in Medical Research (1984)* and the ICRP principle that radiation practices must be justified. Institutions proposing to carry out research involving exposure of human volunteers to ionising radiation must provide:

- copies of the research protocol;
- the participant information sheet;
- estimates of the radiation doses to participants; and
- evidence of approval by the institution's ethics committee.

The Radiation Advisory Committee reviewed this information before approval of the research was given. The 59 research projects reviewed by the Committee are listed in appendix 1.

Of the 59 research projects reviewed, 4 were approved as presented, 44 were approved subject to modifications or further information. This normally required either:

- revised or more detailed radiation dose estimates;
- modification of the radiation risk statements in the participant information sheets; or
- approval from the institute's ethics committee.

There were 2 research projects where further information was sought from the principal researchers prior to their submissions being considered by the Committee

In reviewing the projects the Committee determined that 9 projects did not require the approval of the RAC. This decision was based on the clause of *Administration of Ionizing Radiation to Human Subjects in Medical Research (1984)*, which states:

> *Where the person irradiated is a patient who may benefit from the procedure, the justification for the irradiation can be judged in the same way as for other medical exposures. Nevertheless, because of the experimental nature of the procedure, it should still be subject to thorough review by the ethics committee.*

Of the projects submitted to the RAC for consideration, a number involved the irradiation of human volunteers under the age 18 years. For persons under the age of 18, ARPANSA states in its Radiation Protection Series No. 1 *Recommendations for limiting exposure to ionizing radiation (1995)* (republished March 2002) that:

> *Volunteers should, where practicable, be over 40 years of age, and preferably over 50. Persons under the age of 18 should normally not be permitted to be exposed to radiation as volunteers in medical research. Young children, in particular, are not in a position to give informed consent. However, if an ethics committee regards a special case as justified, exposure of the children should*

conform to a cumulative effective dose of 5 mSv by age 18 years and be permitted only if the information sought cannot be obtained using adult volunteers, and only with the approval of those legally responsible for the child.

In examining research proposals that involved the irradiation of minors, the Committee had to ensure that the radiation exposure could be justified on the basis that:

- the research project did indicate a beneficial outcome;
- each project submission presented a satisfactory case for the need to irradiate volunteers of this age group;
- the research in question could not be carried out using volunteers over 40 years of age; and
- the cumulative radiation dose to the volunteers from all research would be less than 5 mSv.

Given the possible sensitivities of the irradiation of children, the Committee wished to be assured that the ethics committees of the institutions had assessed the proposal in respect of the ARPANSA recommendation noted above.

3. NON-IONISING RADIATIONS

3.1 Request for Funding of Solarium Compliance Study

The Committee was informed that, following a request from Cancer Council Victoria, the Department of Human Services had provided funds to the Council to conduct a survey of solaria in inner Melbourne. The survey was designed to determine compliance of solaria with the Australian/New Zealand Standard. The Committee requested that they be provided with a copy of the results once they were available.

3.2 3G High-Speed Video Phone Towers Study

The COFAM (COgnitive Functions And Mobiles) study, conducted by the Netherlands Organisation for Applied Scientific Research TNO Physics and Electronics Laboratory was brought to the attention of the Committee for comment.

The study compared radiation emissions from base stations for the current mobile telephone network with radiation emissions from base stations for the 3G new generation high-speed video phones network. The study suggested that emissions from the base stations for the high-speed video phones may cause headaches and nausea.

In summary the Committee advised that the results were inconsistent with other research and concluded that it was premature to draw any firm conclusions from the reported findings.

3.3 Research Briefing: RF Gateway: 'No support for a mobile phone effect on brain tumour location'.

The Committee was provided with a copy of a research briefing/commentary for information, which was conducted by JC Lathrop of RF Gateway and entitled: '*No support for a mobile phone effect on brain tumor location*' (dated January 7, 2004).

The briefing reviewed an article published in late 2003 by Donncha O'Brien *et al*. in which the association between a mobile phone user's dominant hand and the anatomical distribution (laterally) of glial brain tumours in Irish neurosurgical patients was analysed. O'Brien *et al.* observed no evidence to support the hypothesis that glioma occurs statistically significantly more often on the dominant hand side among phone users. Additionally, O'Brien *et al*. noted that the Irish Cancer registry from 1994 to 1997 showed no increasing brain tumour trend with increased mobile phone use in the same period.

Weaknesses of this study include imprecise exposure assessment and potential for recall bias.

3.4 Swedish EME Report: 'Recent Research on Mobile Telephony and Cancer and Other Selected Biological Effects: First annual report from SSI's Independent Expert Group on Electromagnetic Fields'

The Committee was provided with a copy of the Swedish EME Report entitled 'Recent Research on Mobile Telephony and Cancer and Other Selected Biological Effects: First annual report from SSI's Independent Expert Group on Electromagnetic Fields' (dated December 2003).

In December 2003, the Swedish Radiation Protection Authority (SSI) issued its first annual report reviewing the latest scientific evidence on wireless phones and health published since the 2000 Stewart Report on Mobile Phones and Health. The report, *Recent Research on Mobile Telephony and Cancer and Other Selected Biological Effects,* concluded "*the overall scientific assessment has not changed markedly since the Stewart report was published and the conclusions that were formulated at the time are still to a great extent valid.*"

The Independent Expert Group (IEG) focused its review on five wireless phone and health research areas - epidemiological studies of cancer, experimental cancer research, blood-brain barrier, heat shock proteins, and the precautionary framework. The report concluded the following:

Epidemiology Studies -

"Overall the majority of the studies have found no indication of increased risks, although some positive findings are reported in two studies. There are, however, methodological considerations that limit the interpretability of these few positive findings. Thus, current evidence is inconclusive regarding cancer risk following RF (Radio Frequency) exposure from mobile phones."

Experimental Cancer Studies -

"Recent animal studies have not provided evidence that RF radiation similar to that emitted by mobile phone could induce cancer or enhance the effect of known carcinogens."

Heat Shock Proteins (HSP)-

"...it is presently not possible to conclude about the existence and the mechanism of these effects and even less about relevant health consequences. However this is an important area for research as HSP expression might be used as a marker for RF exposure."

Blood Brain Barrier (BBB) -

"Overall, results published or communicated on the BBB have drawn a lot of attention but a careful analysis of the available data does not indicate the existence of a health risk. However, further work in this area must be performed."

On the topic of the precautionary principle, the Committee noted that the research group supported the work being done within the World Health Organization (WHO) to develop a precautionary framework that advocates "precautionary thinking at all stages of issue management..."

Finally, it was also noted that the IEG report found that none of the research areas have reported, "break through results that have warranted firm conclusions in one way or another." The IEG also concluded that more research is needed and supported the "intense research that is currently going on in several countries."

3.5
Article: 'Cellular Telephone Use and Risk of Acoustic Neuroma', H.C.Christensen et al Am J. of Epidemiol 2004; 159:3, 277-283.

This was the first publication from the INTERPHONE study coordinated by the World Health Organization/International Agency for Research on Cancer (WHO/IARC) which involves 14 nations including Australia. This publication from the Danish team of researchers within the INTERPHONE project had published results for the Danish study population, which was limited to Acoustic Neuroma at this point. No results were available for brain tumors at the time. The authors concluded:

Use of a cell phone for 10 years or more did not increase acoustic neuroma risk over that of short-term users. Furthermore, tumors did not occur more frequently on the side of the head on which the telephone was typically used, and the size of the tumor did not correlate with the pattern of cell phone use. The results of this prospective, population-based, nationwide study, which included a large number of long-term users of cellular telephones, do not support an association between cell phone use and risk of acoustic neuroma.

3.6
Article: 'Health Effects from Radiofrequency Electromagnetic Fields: report of an independent Advisory Group on Non-Ionising Radiation' by NRPB 2004, U.K, 14:2, 1-6.

The Committee noted that the report examined possible health effects of exposure to radiofrequency (RF) fields, with an emphasis on studies conducted since the review by the Independent Expert Group on Mobile Phones (IEGMP) in 2000. Studies reviewed by IEGMP suggested possible cognitive effects of exposure to RF fields from mobile phones, and possible effects of pulse modulated RF fields on calcium efflux from the nervous system.

The report indicated that the overall evidence on cognitive effects remains inconclusive, while the suggestions of effects on calcium efflux have not been supported by more recent, better-conducted studies. The biological evidence suggested that RF fields do not cause mutation or initiate or promote tumour formation, and the epidemiological data overall do not suggest causal associations between exposures to RF fields, in particular from mobile phone use, and the risk of cancer. Exposure levels from living near to mobile phone base stations are extremely low, and the overall evidence indicates that they are unlikely to pose a risk to health. Little has been published specifically on childhood exposures to RF fields, and no new substantial studies on this have been published since the IEGMP report. In aggregate the research published since the IEGMP report does not give cause for concern. The weight of evidence now available does not suggest that there are adverse health effects from exposures to RF fields below guideline levels, but the published research on RF exposures and health has limitations, and mobile phones have only been in widespread use for a relatively short time. The possibility therefore remains open that there could be health effects from exposure to RF fields below guideline levels; hence continued research is needed.

3.7 The Health Council of Netherlands Update: 'Electromagnetic Fields: Annual Update 2003'.

The Committee was provided with a copy of a national review conducted by the Netherlands Health Council. The Committee was also provided with the views of the CTIA (Cellular Telecommunications Industry Association in the US) regarding this report.

A second government report on electromagnetic energy (EME) from mobile phones was issued reviewing current scientific studies on mobile phones and health effects. The Health Council of the Netherlands' report reviews data from experimental animal and epidemiological studies on mobile phones. The previous day the British National Radiological Protection Board issued its scientific review of EME health concerns and mobile phones. Both government reports recommended further research on a number of areas requiring further clarification.

The Electromagnetic Fields Committee of the Health Council of the Netherlands was created in 2000 to regularly publish reports on scientific developments in its field of interest. In its 2002 Advisory Report, the Council concluded that "there is no reason to revise its recommendations with regards to exposure limits...that no health problems can be expected to occur as a direct result of exposure to those [RF] fields. Furthermore the Committee feels that there are no health based reasons for limiting the use of mobile phones by children."

In the latest annual review, the Committee limits its review to certain new studies, issues made by mobile phones raised by the media and important new technological developments. This review makes no overarching conclusion, but issues the following statements for each subject area:

Experimental Animal Studies - Blood Brain Barrier:
"...that it has not been scientifically established that exposure to electromagnetic fields has any effect on the blood-brain barrier. Additional studies into such effects are currently in progress."

RF Exposure and relation to Wireless Phones Lymphomas and Other Tumors:
"there is no convincing evidence, that in experimental animals, the incidence of lymphomas and other types of tumors is influenced by lifetime, virtually daily exposure to electromagnetic fields such as those used in mobile telecommunications."

Epidemiology Studies - Brain Tumors:
The report focused on two epidemiology studies. First, in looking at the most recent study by Dr. Lennart Hardell and reviews by the Swedish Radiation Protection Authority (Boice and McLaughlin) the committee concluded "*Hardell's more extensive study also has so many flaws that it cannot be used as a basis for drawing conclusions about whether there is a relation between the use of a mobile or cordless telephone and the incidence of tumors*."

In its review of the second epidemiology study by Finish researcher Auvinen, the report concluded, "*this study provides little or no relevant information about the possible causal relationship between the use of a mobile phone and the occurrence of brain tumors*." There has been significant controversy around the Auvinen study when it was published in 2002 because of the imprecise nature of the exposure tools used.

Non-Specific Symptoms and Electromagnetic Fields:
"Some people attribute a variety of symptoms to exposure to electromagnetic fields. However, past work involving experimental exposure has shown that there is no causal relationship between these symptoms and any kind of exposure."

Lastly, the Annual Review discussed the adoption of the Precautionary Principle. In 2004, the Health Council of the Netherlands will establish a Precaution and Public Health Committee to prepare a general advisory report on precaution. In its conclusion the Committee stated, "*the Precautionary Principle is not, by definition, the same thing as taking measures to reduce exposure. It can also include other actions*." The Committee states, "*carrying out further research...together with monitoring scientific developments and publishing its findings...are adequate steps in the current context of precautionary measures.*"

3.8
Article: 'No association between the use of cellular or cordless telephones and salivary gland tumours' L Hardell et al, Occup Environ Med 2004;61:675–679.

The authors investigated the association between the use of cellular or cordless telephones and the risk for salivary gland tumours. Cases were assessed from the six regional cancer registries in Sweden. Four controls matched for sex and age in five year age groups were selected for each case. A total of 293 living cases and 1172 controls were included. There were 267 (91%) participating cases and 1053 (90%) controls. Overall no significantly increased risk was found. Odds ratios were 0.92 (95% CI 0.58 to 1.44) for use of analogue phones, 1.01 (95% CI 0.68 to 1.50) for use of digital phones, and 0.99 (95% CI 0.68 to 1.43) for use of cordless phones. Similar results were found for different salivary gland localisations. No effect of tumour induction period or latency was seen, although few subjects reported use for more than 10 years.

3.9
Research Briefing: RF Gateway 'Investigation Does Not Confirm Alleged Cancer Cluster around Mast'.

The Committee was provided with a copy of the Gateway Information Services research briefing entitled 'Investigation Does Not Confirm Alleged Cancer Cluster around Mast' (May 17, 2004) (Northern Ireland) for information. This briefing documented the findings of the Northern Ireland Cancer Registry's investigation into what was perceived to be an unusually high incidence of cancer in the vicinity of a mobile phone mast. The researchers studied four geographic units to characterize the area surrounding the mast and reviewed the cancer data for the full Northern Ireland population. The investigators reported that no excess cancer is present in the region surrounding the mast.

3.10
Research Briefing: RF Gateway 'GSM Base Station Locations Incorporated into GIS Database in the Netherlands'.

The Committee was provided with a copy of the Gateway Information Services research briefing entitled 'GSM Base Station Locations Incorporated into GIS Database in the Netherlands' (May 25, 2004) (Seville Spain) for information.

This briefing outlined the concerns raised by Emile van Deventer of the WHO's international EMF project regarding the dangers of presenting non-peer reviewed papers to the public and decision-makers at the ICNIRP workshop and symposium.

An example quoted of this was the media attention gained by the 2003 study sponsored by the Netherlands Organization for Applied Scientific Research (TNO), which had reported adverse "quality of life" effects from exposure to UMTS base station signal.

As a follow-up to the TNO study, Santini et al in 2002 reported subjective health complaints for people who estimated that they lived closer than 100, 200 or 300 metres to a base station. One major criticism of Santini's study was the use of subjects self-reported estimates of distance to the base station rather than actual measurements. Bolte and colleagues, working for the National Institute of Public Health and the Environment (RIVM) in the Netherlands presented preliminary results from the incorporation of GSM base-station locations into a GIS database.

GSM base stations locations were imported into a GIS database. They found that as of 2003, there were 22,000 transceivers in the 900 MHz band and 33,000 transceivers in the 1800 MHz band in 11,000 locations in The Netherlands. Respondents were asked a number of questions including whether they lived close (closer than 50 m, 100 m, 200 m or 300 m) to a base station and whether they were concerned about the proximity. Bolte and colleagues reported that base stations are often camouflaged, far fewer people reported living near a base station than actually do. Future work of the authors plan to incorporate UMTS, radio, and television broadcast towers into the GIS database.

3.11
Article: 'Possible induced enhancement of dispersion forces by cellular phones' by Bo E. Sernelius, Phys. Chem.Chem. Phys, 2004, 6, 1363-1368 (Sweden).

The article `*Possible induced enhancement of dispersion forces by cellular phones*' by Bo E. Sernelius, Phys. Chem.Chem. Phys, 2004, 6**,** 1363-1368 (Sweden) was presented to the Committee for information.

The Committee noted that the researchers derived the dispersion forces between objects in the presence of a non-thermal radiation field. Prof. Sernelius calculated that the attractive force between 2 blood cells is increased by 10 orders of magnitude when changing the radiation spectrum from thermal to one that is peaked in the microwave region. The authors of this article claim that since the results depend on the water and ion content in the blood and blood cells and since these vary between individuals and also depend on the person's health status the effects can vary from person to person. Another possible result from the radiation could be that small blood vessels contract and thereby limit the flow of blood through them; the surface energy of the blood vessel might increase drastically making a contraction energetically favourable. Still other unwanted effects could be growth of precipitates in tissue and organs. At this stage the authors claim that this is speculation and more work is required. Finally, the authors claim that their present work should not be considered as proof that cellular phones are harmful.

The weakness of the model calculations lies in the incomplete input data for the dielectric properties of the biological tissue and in the description of the radiation field. The authors hope that this study will stimulate efforts to measure the dielectric properties of all components in biological tissue over the full spectral range, making more realistic studies feasible.

Follow-up work conducted by Dr Robert Adair, Dept. of Physics, Yale University, New Haven CT, USA, entitled *'Comments on a Calculation by Sernelius of the Enhancement of Dispersive Forces by the Presence of Endogenous Fields*', reviewed the basis of Sernelius' arguments and refutes his claims. Adair's calculations showed that those of Sernelius' had overestimated the effect by 11 orders of magnitude.

3.12
Article: 'Resting EEG Affected by Exposure to a Pulsed ELF Magnetic Field' by CM Cook, AW Thomas, and FS Prato, Bioelectromagnetics 25:196-203 (2004)

The article '*Resting EEG Affected by Exposure to a Pulsed ELF Magnetic Field*' by CM Cook, AW Thomas, and FS Prato, Bioelectromagnetics 25:196-203 (2004) was presented to the Committee for information.

Recent publications reviewing the effects of exposure to weak ELF MFs and ELF modulated radiofrequency fields upon human electrophysiology and cognitive processing suggests that brief ELF MF exposures influence human brain electrical activity as measured by electroencephalography. Subjects aged between 20-32 (10 males/10 females) underwent two sessions, one consisting of a 15-minute exposure to a specific pulsed ± 200 μT magnetic field, with the other sessions consisting of 15 minutes of sham exposure. Cook et al found that after 15 minutes of exposure to pulsed ELF magnetic fields was found to result in higher resting electrophalography (EEG) occipital alpha activity compared to a sham exposure. They suggest that this result may be a non-specific effect related to the pulse or intermittent nature of the fields. The authors also suggested that such effects maybe associated with ELF component of mobile phone emissions. However, the field characteristics were significantly different from that generated by pulsed currents in batteries of digital mobile phones.

3.13
Research Briefing: RF Gateway - Heat Shock Protein Work not Replicated.

Dr David de Pomerai of Nottingham University, U.K., stunned participants at "heat shock protein (Hsp) workshop" in Helsinki in April by reporting that his previous findings of RF-related stress in transgenic nematode worms have disappeared after improvements in the exposure system and animal handling were carried out. de Pomerai recalled that he received the attention of the U.K.'s Mobile Telecommunications Health Research (MTHR) program a couple of years ago with his finding that exposure to a weak RF signal (1.0 GHz, 0.5 W, continuous wave with estimated SAR 5 to 40 mW per kg) induced the expression of reporter genes regulated by Hsp16-1 small heat-shock promoter protein. MTHR asked de Pomerai and colleagues to repeat and extend their experiments in C. elegans, but only after fully characterizing the exposure and experimental systems.
"It turns out they were right" to insist on the overhaul, de Pomerai commented at the Helsinki workshop. He reported, with the new, fully controlled exposure set-up, exposure time reduced to two hours and using standardized animal handling techniques, there is no longer any difference between RF-exposed and sham-exposed animals in the Hsp experiments.

3.14
UK Issues Revised Guidelines for the Use of Mobile Communications Systems in Hospitals.

The Committee was presented with a report from the Medical Devices section of the Medicines and Healthcare Products Regulatory Agency in the UK for information.

The Medical Devices section of the Medicines and Healthcare products Regulatory Agency (MHRA) in the UK had issued revised guidelines for the use of mobile communications systems in hospitals. The MHRA stated "Cell phones (mobile phones) and other communication equipment (e.g. radio devices) can be essential in hospitals for good patient management. However, such equipment produces electromagnetic interference (EMI) and this can affect medical devices in an adverse way. This can be a particular problem when mobile communication devices are brought into

hospitals by patients, visitors and staff in an uncontrolled manner. Therefore some restrictions are necessary to minimise the risk of interference with critical medical equipment." They classify risk for different communications systems into high, medium and low and make recommendations accordingly. They conclude:

Healthcare providers should actively manage the use of the radio frequency spectrum in their own sites. This includes considering areas where medical devices will not be affected and therefore no restrictions apply and other areas where authorised staff can use communication devices authorised by the hospital. Report incidents to the MHRA when a medical device is suspected to have suffered electromagnetic interference.

The Committee also noted that the MHRA also provide copies of posters designating mobile use and non-mobile use areas. Copies of these posters are located at their website.

3.15
Mobile Phone Interference Review Published in the Medical Journal of Australia

The Committee was presented with a review published in the Medical Journal of Australia detailing issues with interference from mobile phones.

Lawrentschuk and Bolton published an article in the Medical Journal of Australia "Mobile phone interference with medical equipment and its clinical significance: a systematic review" MJA 181 (3): 145-149; 2004. In this paper the authors offer the view:
The safest option is the "1 m rule" proposed by Irnich and Tobisch — restrict mobile phone use to greater than 1 m from equipment. Staff, patients and visitors need to be made aware of the risk to patient safety if mobile phones are used, particularly within 1 m of sensitive medical equipment. To avoid confusion, it is probably best to restrict use by patients and visitors unless they are in mobile phone "friendly zones" within a hospital. Although policies have been recommended in Australia to take into account changing mobile phone technology and relaxation of some restrictions, their local implementation is difficult and may be costly, involving education of clinicians, patients and the public to be successful.

The RAC concluded that there should be some discussion nationally about the issue of mobile phone use in hospitals with a view to adopting the approach of the MHRA in the UK.

3.16
Unpublished report on alleged adverse effects of mobile phones on male fertility.

A research team in Hungary led by Fejes *et al.* gave a presentation at a conference, which concluded "The prolonged use of cell phones may have negative effects on spermatogenesis and male fertility, that presumably deteriorates both concentration and motility. Further controlled randomized studies are necessary to precise the correlation coefficients". This study was widely publicized and attracted comment from experts in the field.
Professor Hans Evers of the Academic Hospital in Maastricht, Netherlands and past president of the European Society of Human Reproduction and Embryology (ESHRE) Conference where the research was presented said:

It is an observational as opposed to interventional study which appears not to take into account the many potential confounding factors which could have skewed the results. For example, what if heavy mobile phone users in Hungary have particularly stressful lives and jobs? What if they come from a different age group or social class than the non-users? These factors would have a considerable effect on the outcome of the research.

Dr Gab Kovacs, Medical Director, Monash IVF who attended the ESHRE conference says he is "cynical about the findings and is taking them with a grain of salt". He said a man's sperm count "goes up and down quite a bit" and could vary greatly from one day to the next. "You'd expect a 30 per cent variation just among men randomly," he said. He said the test findings would need to be repeated in further research before they could be seen as conclusive.

Dr Michael Clark, spokesman for the National Radiological Protection Board, said:

I understand that no allowance has been made for possible confounding factors. For example, if older men in Hungary are more likely to wear mobile phones in pouches on their belts than younger men, any observation on sperm quality is going to be meaningless. Smoking and occupation can also have a significant influence on sperm quality… People should not change their habits on the basis of one study reported at a conference.

The Committee felt that the criticisms were valid and we would have to await publication of the study in a peer reviewed journal before making further comment.

3.17
Three new NIR communications from ICNIRP

The Committee noted three new communications from the International Commission on Non-Ionising Radiation Protection (ICNIRP):

Guidelines on limits of exposure to ultraviolet radiation of wavelengths between 180nm and 400nm (Incoherent optical radiation) Health Physics 87:171-186; 2004.

Medical Magnetic Resonance (MR) Procedures: Protection of Patients Health Physics 87:197-216; 2004.

ICNIRP Statement Related to the Use of Security and Similar Devices Utilizing Electromagnetic Energy. Health Physics 87:187-196; 2004.

3.18
Article: Ocular Melanoma and mobile phone use Inskip et al "Trends in ocular melanoma in the United States, 1974–1998", Cancer Causes and Control 2003; 14: 251–257.

In this publication the authors examined the role of mobile phones with the incidence of ocular melanoma as a follow up to a recent report which noted a fourfold risk of ocular melanoma associated with employment in occupations involving use of cellular telephones. The authors examined time trends in the incidence of melanoma among whites in the United States, based on data collected through the surveillance, Epidemiology, and End Results (SEER) program for 1974–1998. The incidence of ocular melanoma decreased over time in both sexes, with no indication of a recent increase during the 1990s. The annual percent change was -0.7% for males (95% confidence interval: -2.3, 0.9) and -1.2% for females (95% confidence interval: -2.5, 0.0). Time trends appeared to differ by subsite of ocular melanoma. In contrast, all subsites of cutaneous melanoma, including the face and adjacent areas, showed marked increases in incidence over the observation period. The authors concluded the dramatic increase in use of cellular telephones has not been accompanied by an increase in the incidence of ocular melanoma. Further study is required to explain the different time trends for subsites of ocular melanoma, and for ocular versus facial and other cutaneous melanomas.

3.19
Article: 'Malignant melanoma of the skin---not a sunshine story!' Hallberg O, Johansson O. Medical Science Monitor 2004;10(7):CR336-CR340.

The researchers collected data on incidence and death rates from malignant skin melanoma from Sweden, Norway, the US, Denmark, and New Zealand using the World Health Organization mortality database and Swedish death statistics. They also retrieved information on the development of charter air travel from Sweden and the expansion of the Swedish FM radio broadcasting network during the same time period. The authors reported a correlation in time for the rollout of FM/TV broadcasting networks in 1955 while the increased amount of "sun travel" by air (charter) did not start until 7 years after the melanoma trend break in 1955. The authors concluded that the increased incidence and mortality of melanoma of the skin cannot solely be explained by increased exposure to UV-radiation from the sun and that continuous disturbance of cell repair mechanisms by body-resonant electromagnetic fields from FM transmissions appears to amplify the carcinogenic effects resulting from cell damage caused e.g. by UV-radiation.

The Committee discussed this paper and concluded that this was an ecological study that could, at best, only generate a hypothesis and that it was most unlikely that the introduction of FM transmission towers would have an almost immediate impact on melanoma incidence and mortality, particularly since there was no established mechanism of interaction. The Committee considered the wide spread use of home solaria in Sweden may be a more plausible reason for the observed increase in melanoma incidence and mortality.

APPENDICES

APPENDIX 1

TABLES OF RESEARCH PROJECTS

(i) Research Projects Approved by the Committee

LICENSEE	RESEARCH WORK LOCATION	PRINCIPAL RESEARCHER
RESEARCH PROJECT TITLE		
La Trobe University	School of Physiotherapy	Dr Hylton Menz
Foot and Footwear Risk Factors for Postural Instability and Falls in Older People		
Austin Health	Dept. of Nuclear Medicine and Centre for PET	Assoc. Prof. Christopher Rowe
C-11 Flumazenil Positron Emission Tomography in Focal Epilepsy		
Mental Health Research Institute		Associate Professor David Ames
A randomised, Multicentre, double-blind, placebo-controlled, 18 month study of the efficacy of xaliproden in patients with mild to moderate dementia of the Alzheimer type". Protocol No. EFC2724		

(ii) Research Projects Recommended for Approval by the Committee Subject to Modifications or Further Information

LICENSEE	RESEARCH WORK LOCATION	PRINCIPAL RESEARCHER
RESEARCH PROJECT TITLE		
Box Hill Hospital	Department of Gastroenterology	Professor Peter Gibson
A phase lll multi-national, multi-centre, double-blind placebo-controlled parallel group, 26 week study to assess the safety and efficacy of the humanized anti-TNF PEG conjugate, CDP870 400mg sc (dosed at weeks 0,2,4 then 4-weekly to week 24), in the treatment of patients with active Crohn's Disease.		
Box Hill Hospital	Department of Gastroenterology	Professor Peter Gibson
A phase III multi-national, multi-centre, open label, 52 week safety study to assess the safety of chronic therapy with the humanized anti-TNF PEG conjugate, CDP870 400mg sc (dosed at 4-weekly to week 48), in the treatment of patients with active Crohn's Disease who have previously completed studies CDP870-031 or CDP870-032.		
Box Hill Hospital	Department of Gastroenterology	Professor Peter Gibson
A phase III multi-national, multi-centre, open label, 52 week safety study to assess the safety of re-exposure after a variable interval and subsequent chronic therapy with the humanized anti-TNF PEG conjugate, CDP870 400mg sc (dosed at weeks 0,2,4 then 4-weekly to week 48), in the treatment of patients with active Crohn's disease who have previously been withdrawn from studies CDP870 031 or CDP870-032 due to an exacerbation of Crohn's Disease.		
Royal Melbourne Hospital	Dept. of Neurology	Dr Ken Butcher
Perfusion in Acute Stroke (PIAS) Protocol.		
Barwon Health – The Geelong Hospital	Dept. of Cardiology	Associate Professor Sandy Black
Oral Rapamycin inhibits restenosis: phase ll (ORBIT ll).		

(ii) Research Projects Recommended for Approval by the Committee Subject to Modifications or Further Information

LICENSEE	RESEARCH WORK LOCATION	PRINCIPAL RESEARCHER
RESEARCH PROJECT TITLE		
Box Hill Hospital	Eastern Melbourne Neurosciences	Dr Helmut Butzkueven
A multi-centre, randomized, double-blind, Long-term extension study to determine the safety, tolerability and preliminary efficacy of CCI-779 in subjects with relapsing Multiple Sclerosis.		
Box Hill Hospital	Dept. of Cardiology	Associate Professor Gishel New
The COSTAR ASIA Cobalt Chromium Stent with Antiproliferative for Re-stenosis in ASIA trial.		
Austin & Repatriation Medical Centre	Department of Neurology	Professor David Reutens
Dopaminergic-cholinergic interactions in frontal lobe epilepsy.		
Royal Melbourne Hospital	Orthopaedic and Rheumatology Departments	Associate Professor Geoff McColl
A randomized, double-blind, dose-ranging trial of CNTO 148 subcutaneous injection compared with placebo in subjects with active rheumatoid arthritis despite treatment with methotrexate.		
Royal Melbourne Hospital	Dept. of Nuclear Medicine	Dr Meir Lichtenstein
A phase III, multi-centre, randomized, cross-over, controlled clinical trial to evaluate the safety and efficacy of Technegas in lung ventilation imaging with comparison to DTPA aerosol ventilation images.		
University of Melbourne	Centre for Sports Medicine Research & Education	Dr Rana Hinman
Predictors of effects of laterally-wedged insoles in knee osteoarthritis.		

(ii) Research Projects Recommended for Approval by the Committee Subject to Modifications or Further Information

LICENSEE	RESEARCH WORK LOCATION	PRINCIPAL RESEARCHER
RESEARCH PROJECT TITLE		
The Alfred Hospital	Baker Heart Research Institute	Professor David Kaye
Research Study Using the Cardiac Dimensions, Inc. (CDI) Percutaneous Mitral Annuloplasty Device (PMAD) for the Temporary Plication of the Mitral Annulus in a Dilated Cardiomyopathy Patient Population		
Barwon Health- The Geelong Hospital		Dr Robin Daly
Does increased dietry Calcium-Vitamin D and exercise increase bone density in older men?		
Monash Medical Centre	Department of Respiratory and Sleep Medicine	Dr Stijn Mol
Comparison of Australian and International Clinical COPD Staging Systems		
Barwon Health - The Geelong Hospital	General Medicine	Dr Alastair Mander
A randomized, multicentre, double-blind, placebo-controlled, 18-month study of the efficacy of xaliproden in patients with mild-to-moderate dementia of the Alzheimer's type Protocol EFC2724		
International Diabetes Institute		Dr Jonathon Shaw
Insulin Detemir NN304-1595. A two year, multinational, multicentre, 2:1 randomised, parallel open-labelled trail comparing efficacy and safety of Insulin Detemir and NPH insulin in type 1 subjects with diabetes on a basal-bolus treatment regimen with insulin aspart as mealtime insulin		
Diabetes and Specialist Centre		Dr Serge Tang-Fui
Insulin Detemir NN304-1595. A two year, multinational, multicentre, 2:1 randomised, parallel open-labelled trail comparing efficacy and safety of Insulin Detemir and NPH insulin in type 1 subjects with diabetes on a basal-bolus treatment regimen with insulin aspart as mealtime insulin		

(ii) Research Projects Recommended for Approval by the Committee Subject to Modifications or Further Information

LICENSEE	RESEARCH WORK LOCATION	PRINCIPAL RESEARCHER
RESEARCH PROJECT TITLE		
Box Hill Hospital	Department of Gastroenterology	Professor Peter Gibson
A Randomised, Placebo- controlled, Double-blind Trial to Evaluate the Safety and Efficacy of Infliximab in Patients with Active Ulcerative Colitis		
Monash Medical Centre	Department of Respiratory	Dr Solin
Nutritional Assessment in Cystic Fibrosis Study		
Deakin University	School of Exercise and Nutrition Sciences	Dr Tim Crowe
Evaluation of changes in health status in people with eating disorders during the initial stages of treatment		
Austin Health	Dept. of Nuclear Medicine and Centre for PET	Assoc. Prof. Christopher Rowe
Imaging Brain Amyloid with 11C-PIB and PET		
The Avenue Hospital	Dept. of Surgery - Monash University	Dr John Dixon
A prospective observational study of the effects of a very low calorie diet on liver volume and intra-abdominal fat mass in the severely obese		
Southern Health Dandenong Hospital	Dept. of Vascular Science and Medicine	Dr Helena Teede
Optimisation of Southern Health Osteoporotic Fracture Screening and Prevention		
Austin Health	Dept. of Endocrinology	Prof. Ego Seeman
Axial and Appendicular Skeletal Growth in Chinese and Caucasian Boys and Girls		

(ii) Research Projects Recommended for Approval by the Committee Subject to Modifications or Further Information

LICENSEE	RESEARCH WORK LOCATION	PRINCIPAL RESEARCHER
RESEARCH PROJECT TITLE		
St. Vincent's Hospital - Melbourne	Dept. of Neurosciences	Dr Les Sedal
A Multinational, Multicentre, randomised, Double-blind, Placebo Controlled, Parallel Group Study to Evaluate the Effect of early Glatiramer Acetate treatment in Delaying the Conversion to Clinically Definite Multiple Sclerosis (CDMS) of subjects presenting with a clinically isolated syndrome (CIS)		
Austin Hospital	Dept. of Neurology	Assoc. Prof. Richard Macdonell
A Multinational, Multicentre, randomised, Double-blind, Placebo Controlled, Parallel Group Study to Evaluate the Effect of early Glatiramer Acetate treatment in Delaying the Conversion to Clinically Definite Multiple Sclerosis (CDMS) of subjects presenting with a clinically isolated syndrome (CIS)		
Box Hill Hospital	Dept. of Gastroenterology	Dr Sally James
Transit time and colonic fermentation in ulcerative colitis in remission and controls		
Quintiles Pty Limited *On behalf of:* St. Vincent's Hospital, Melbourne The Royal Melbourne Hospital Cabrini Medical Centre Barwon Health- The Geelong Hospital Austin Hospital		Ms. Jacqui Watson
Protocol H4Z-MC-GJAD Effects of Arzoxifene on Vertebral Fracture Incidence and on Invasive Breast cancer Incidence in Postmenopausal Women with Osteoporosis or with Low Bone Density		
Barwon Health The Geelong Hospital	University of Melbourne, Dept. of Clinical and Biomedical Sciences	Assoc. Prof Mark Kotowicz
***Requested Amendment*: 'A multicentre, double-blind, randomised, placebo-controlled study to evaluate the safety and efficacy of Zoledronic acid in the treatment of Osteoporosis in post menopausal women taking Calcium and Vitamin D'**		

(ii) Research Projects Recommended for Approval by the Committee Subject to Modifications or Further Information

LICENSEE	RESEARCH WORK LOCATION	PRINCIPAL RESEARCHER
RESEARCH PROJECT TITLE		
St Vincent's Hospital	Department of Gastroenterology	Dr William Connell
A Phase III, multicentre, double-blind, placebo-controlled study of the safety and efficacy of intravenous Antegren™ (natalizumab) in subjects with moderately to severely active Crohn's Disease with elevated C-Reactive Protein"		
Barwon Health The Geelong Hospital	Dept. of Clinical and Biomedical Science	Prof. Geoffrey Nicholson
A Multicenter, Double-Blind, Randomized, Active-Controlled, Parallel Group, Noninferiority Study Comparing 75mg Risedronate Dosed on Two Consecutive Days Monthly with 5mg Daily Risedronate in the Treatment of Postmenopausal Osteoporosis as Assessed over 24 Months.		
Monash Medical Centre	Department of Medicine	Prof. William Sievert
A Phase I Study of Intra-arterial Clofazimine in Lipiodol® Injection in Patients with Unresectable Primary Hepatocellular Carcinoma (Study Number: CFZ101)		
Austin Health	Dept. of Nuclear Medicine and Centre for PET	Assoc. Prof. Christopher Rowe
Project H2004/01758 ^{123}I-Clioquinol in the diagnosis of Alzheimer's Disease by SPECT		
Monash Medical Centre	Kingston Centre	Ms. Susan Baenziger
A clinical and radiological comparison of two supports for the hemiplegic shoulder: The standard hemi-sling and the Hampton sling		
Barwon Health The Geelong Hospital	Dept. of Clinical and Biomedical Science	Prof. Geoffrey Nicholson
A Study to evaluate AMG 162 in the treatment of post-menopausal osteoporosis		

(ii) Research Projects Recommended for Approval by the Committee Subject to Modifications or Further Information

LICENSEE	RESEARCH WORK LOCATION	PRINCIPAL RESEARCHER
RESEARCH PROJECT TITLE		
Western Hospital	Dept. of Cardiology	Professor Yean L Lim
Role of 16-Slice computerised tomography in the evaluation of coronary disease and revascularization procedures		
Western Hospital	Dept. of Cardiology	Professor Yean L Lim
Role of 16-Slice computerised tomography in the evaluation of acute coronary syndrome (CT-ACS): A pilot study		
Royal Melbourne Hospital	Orthopaedic and Rheumatology Departments	Associate Professor Geoff McColl
A phase III, multicentre, double-placebo-controlled study of the efficacy, safety and tolerability of intravenous Antegren™ (Natalizumab 300 mg) in subjects with moderate to severe Rheumatoid Arthritis (RA) receiving concomitant treatment with methotrexate		
Deakin University	School of Exercise and Nutrition Sciences	Dr Rob Daly
The effect of a high red meat diet, in conjunction with resistance training on muscular strength, mass and cellular mechanisms in elderly women		
Box Hill Hospital	Department of Medicine	Professor Hatem Salem
A phase II Randomised, Double-Blinded (BMS-562247 and enoxaparin), Active-Controlled (enoxaparin and warfarin), Parallel-Arm, Dose-Response study of the oral factor Xa inhibitor BMS-562247 in subjects undergoing elective total knee replacement surgery		
Monash Medical Centre	Department of Rheumatology	Assoc. Prof. G. Littlejohn
Double-blind, Placebo-Controlled, Parallel, randomized Study to Evaluate the Efficacy and Safety of 3 Oral Dose Levels of TMI-005 in Subjects with Active Rheumatoid Arthritis on a Background of Methotrexate		

(ii) Research Projects Recommended for Approval by the Committee Subject to Modifications or Further Information

LICENSEE	RESEARCH WORK LOCATION	PRINCIPAL RESEARCHER
RESEARCH PROJECT TITLE		
Monash Medical Centre	Department of Endocrinology	Dr Fran Mouat
Clinical and Psychological Outcomes in Children and Adolescents with Type 1 Diabetes and Coeliac Disease		
Barwon Health The Geelong Hospital	Dept. of Clinical and Biomedical Science	Prof. Geoffrey Nicholson
Requested amendment: Postmenopausal Evaluation and Risk-Reduction with Lasofoxifene (PEARL A218 1002)		
Royal Melbourne Hospital	Dept. of Neurology	Professor Stephen Davis
CHANT (Cerebral Hemorrhage And NXY Treatment) A double blind, randomised, placebo-controlled, parallel group, multicenter, phase IIb study to assess the safety and tolerability of 72 hours intravenous infusion of NXY-059 in adult patients with acute intracerebral hemorrhage (ICH) (SA-NXY-0012)		

(iii) Research Projects requiring further information before being considered by the Committee

LICENSEE	RESEARCH WORK LOCATION	PRINCIPAL RESEARCHER
RESEARCH PROJECT TITLE		
Monash Medical Centre	Department of Rheumatology	Assoc. Prof. G. Littlejohn
An open label study of the efficacy and safety of re-treatments with rituximab (MabThera®/Rituxan®) in patients with active rheumatoid arthritis		
Wangaratta Base Hospital	Department of Nuclear Medicine	Mr. Robert Williams
A study to evaluate the addition of dipyridamole to repeat negative Sestamibi parathyroid imaging		

(iv) Research Projects Submitted that did not Require Committee Approval

LICENSEE	RESEARCH WORK LOCATION	PRINCIPAL RESEARCHER
RESEARCH PROJECT TITLE		
Royal Melbourne Hospital	Dept. of Nuclear Medicine	Dr Meir Lichtenstein
A study to evaluate the biodistribution and radiation dosimetry of Technegas.		
Box Hill Hospital	Dept. of Cardiology	Associate Professor Gishel New
The OAT trial - Occluded Artery Trial.		
Monash Medical Centre	Dept. of Medical Oncology	Dr Vinod Ganju
Neoadjuvant chemotherapy with Docetaxel and Anthracycline based chemotherapy in patients with advanced breast cancer: evaluation of clinical, biological and imaging markers of tumour response: A pilot study'		
Monash Medical Centre	Cardiovascular Research Centre	Assoc. Prof. Ian Meredith
Drug Eluting Stent with Trapidil to Stop Intimal Hypoplasia- "Destiny Study"		
Monash University	Cardiovascular Research Centre	Professor Hatem Salem
Oral Direct Factor Xa Inhibitor BAY 59-7939 in Patients with acute symptomatic proximal deep vein thrombosis (ODIXa-DVT Study) a Prospective, randomized, multinational, multicentre, partially blinded, parallel-group, open-label active comparator controlled phase 11 dose finding and proof of principle trial		
The Royal Melbourne Hospital	Department of Neurosurgery	Dr John Laidlaw
A prospective, Non-Randomised Clinical Study of the Penda VSTM Stunt placed retrograde to blood flow in the treatment of hydrocephalus		

(iv) Research Projects Submitted that did not Require Committee Approval

LICENSEE	RESEARCH WORK LOCATION	PRINCIPAL RESEARCHER
RESEARCH PROJECT TITLE		
Monash Medical Centre	Cardiovascular Research Centre	Assoc. Prof. Ian Meredith
Intravenous Liposomal Alendronate Infusion in Patients Post NIRFLEX Coronary Stent Implantation		
Monash Medical Centre	Cardiovascular Research Centre	Assoc. Prof. Ian Meredith
A Randomised, Controlled Trial to evaluate the safety and Efficacy of the ZoMaxx Drug-Eluting Coronary Stent System Compared to the TAXUS Express Paclitaxel-Eluting Coronary Stent System in de novo Coronary Artery Lesions		
Cabrini Hospital	Cabrini Monash Academic Surgical Department	Dr Corinne Ooi
Does Nizatidine as a prokinetic agent improve delayed gastric emptying in patients post oesophagectomy		

APPENDIX 2a

NUMBER OF OPERATOR LICENCES AS OF 30 SEPTEMBER 2004

CATEGORY	IRRADIATING	SEALED	UNSEALED	ENDORSED
Radiologists	259			41
Radiation Oncologists	6	1		46
Nuclear Medicine Specialists			32	4
General Practitioners	201			
Dentists	2155			
Chiropractors	230			
Dermatologists	3			
Ophthalmologists		18		2
Other Medical Specialists	38		2	
Dental Therapists	197			
Testers	25	2		38
Service Technicians	143	38		53
Research (Human Volunteers)	32	1	8	1
Subtotals	3289	60	42	185

Notes: Endorsed licences are licences which permit use of more than one category of irradiating apparatus, sealed source and unsealed source on the one licence.

(Table continued on next page.)

APPENDIX 2a

NUMBER OF OPERATOR LICENCES AS OF 30 SEPTEMBER 2004 (continued)

CATEGORY	IRRADIATING	SEALED	UNSEALED	ENDORSED
Veterinary Surgeons	645			24
Industrial Radiographers	65	14		207
Consultants				4
Dental Hygienists	85			
Cardiologists	57		1	
Borehole Loggers		35		3
Moisture / Density Gauge Operators		265		
Other Paramedical	19		8	
Radiologist / Nuclear Medicine Specialist				26
Dental Therapist / Dental Hygienist	17			
Service Technician & Tester	3	3		1
Service Person & Industrial Radiographer				1
Veterinarian & Dentist	1			
Cardiologist and Research				1
Vascular Surgeon	24			
Dental Assistant	3			
Subtotals	4208	377	51	452
TOTAL NUMBER OF OPERATOR LICENCES				5088

Notes: Endorsed licences are licences which permit use of more than one category of irradiating apparatus, sealed source and unsealed source on the one licence.

APPENDIX 2b

NUMBER OF REGISTRATIONS AS OF 30 SEPTEMBER 2004

CATEGORY	IRRADIATING	SEALED
Fixed Plain Radiography	400	
Fixed Fluoroscopy (Image intensifiers)	180	
CT Scanner	145	
Linear Accelerator	33	
Radiotherapy	9	16
Dermatology	1	1
Ophthalmology		15
Dental	2092	
Chiropractor	64	
Medical (GP)	32	
X-Ray Analysis	61	
Irradiation Cell		3
Borehole Logging		28
Radiation Gauge	11	388
Nuclear Moisture / Density Gauge		153
Industrial Radiography	78	43
Veterinary	390	5
Calibration		130
Teaching	12	49
Other Industrial	21	97
Research	9	24
Other Medical	7	14
Mammography	160	
OPG / Cephalometric	238	
Cyclotron	3	
Bone Mineral Densitometry	63	
Mobile Image Intensifier	135	
Condensor Discharge Units	100	
Laboratory Irradiator	9	
Lithotriptor	5	
Crawler Guide Sources		13
Veterinary Dental	11	
Therapy Simulator	6	
Cabinet X-ray Equipment	66	
GC-Electron Capture Detector	19	
Mobile Plain Radiography X-ray Unit	79	
Hybrid SPECT-PET/CT scanner System	3	
Sub totals	4442	979
TOTAL NUMBER OF REGISTRATIONS:		5421

APPENDIX 2c

NUMBER OF MANAGEMENT LICENCES AS OF 30 SEPTEMBER 2004

CATEGORY	IRRADIATING	SEALED	UNSEALED	ENDORSED
Sales	45	51	18	13
Industrial			10	
Hospital			15	
Pathology			10	
Education and Research			37	
Research with Human Subjects			23	
Radiotherapy			2	
Nuclear Medicine			55	
Other Medical				
Government Departments			3	
Veterinary			8	
Other Laboratory			0	
Manufacturer				
Transport				15
Transport (Low Level Waste)				6
Subtotals	45	51	181	34
TOTAL NUMBER OF COMPANY/INSTITUTION LICENCES				311

Note: Endorsed licences are licences which permit use of more than one category of irradiating apparatus, sealed source and unsealed source on the one licence.

ABBREVIATIONS AND DEFINITIONS

ACA
Australian Communications Authority

ACPSEM
Australasian College of Physical Scientists and Engineers in Medicine

AIR
Australian Institute of Radiography

ALARA
as low as reasonably achievable

ANSTO
Australian Nuclear Science and Technology Organisation

ARPANSA
Australian Radiation Protection and Nuclear Safety Agency

ARPS
Australasian Radiation Protection Society

Bq
becquerel, a unit of radioactivity
(1 Bq = 1 disintegration per second)

CDMA
code division multiple access

cps
counts per second

CT
computed tomography

DAECA
Dental Assistants Education Council of Australia

DEXA
dual energy X-ray absorptiometry

ELF
extremely low frequency

EME
electromagnetic energy

EMF
electromagnetic frequency

EMR
electromagnetic radiation

EPA
Environment Protection Authority

GBq
gigabecquerel, a unit of radioactivity
(1 GBq = 1,000 000 000 Bq).

GeV
gigaelectron volts
(1 GeV = 1,000 000 000 eV). The electron volt is a unit of energy. The energy required to move an electron through a potential difference of 1 volt.

GHz
gigahertz, a unit of frequency
(1 GHz = 1,000,000,000 Hz)

GP
general practitioner

GM
gieger-müller

GSM
Global system for mobile communication. A digital mobile telephone system.

Hz
hertz, a unit of frequency
(1 Hz = 1 cycle/second)

IAEA
International Atomic Energy Agency

ICNIRP
International Commission on Non-Ionizing Radiation Protection

ICRP
International Commission on Radiological Protection

IEC
International Electrotechnical Commission

IFN
intratemporal facial nerve

ImPACT
Imaging Performance Assessment of CT scanners. A radiation dose spreadsheet developed by ImPACT group, the UK's CT scanner evaluation centre, funded by the Medicines and Healthcare products Regulatory Agency (MHRA). <www.impactscan.org>.

ISO
International Organisation for Standardisation

kBq
kilobecquerel (1 kBq = 1,000 Bq)

keV
kiloelectron volts (1 keV = 1,000 eV). The electron volt is a unit of energy. The energy required to move an electron through a potential difference of 1 volt.

kV
kilovolt (1 kV = 1,000 V)

MBq
megabecquerel (1 MBq = 1,000,000 Bq)

µGy
microgray, a unit of absorbed dose (1 µGy = 0.000,001 Gy)

µSv
microsievert, a unit of equivalent and effective dose (1 µSv = 0.000,001 Sv)

µT
microtesla, a unit of magnetic flux density (1 µT = 10 mG)

MHz
megahertz, a unit of frequency (1 MHz = 1,000,000 Hz)

mG
milligauss, a unit of magnetic flux density (1 mG = 0.001 G)

mGy
milligray, a unit of absorbed dose (1 mGy = 0.001 Gy)

MIT
medical imaging technologist

mSv
millisievert, a unit of equivalent and effective dose (1 mSv = 0.001 Sv)

mT
millitesla, a unit of magnetic flux density (1 mT = 10 G)

MRTB
Medical Radiation Technologists Board

NATA
National Association of Testing Authorities

NCRP
National Council on Radiation Protection and Measurements

NHMRC
National Health & Medical Research Council

NIR
non-ionizing radiation

NMT
nuclear medicine technologist

NORM
naturally occurring radioactive materials

NRPB
National Radiation Protection Board (UK)

OPG
orthopantograph

PET
positron emission tomography

RAC
Radiation Advisory Committee

RANZCR
Royal Australian and New Zealand College of Radiologists

RF
radiofrequency

RMIT
Royal Melbourne Institute of Technology

RSO
radiation safety officer

RSP
Radiation Safety Program (Department of Human Services)

SI
Système International d'Unités is a coherent system of units of measurements developed from the MKSA (metre-kilogram-second-ampere) system.

Sv
sievert, the special name given to the equivalent and effective dose unit, J kg^{-1}

TLD
thermoluminescent dosimeter

V/m
volts/metre, a unit of electric field

W/kg
Watts per kilogram - a unit the amount of absorption of radiofrequency radiation energy.

WHO
World Health Organisation