THE WORK OF A PROVINCIAL RADIATION CONTROL UNIT IN CANADA.

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Background.

The Statute of Westminister which established the Dominion of Canada, also identified the areas of responsibility of the federal and provincial governments. Public health and occupational health come in the latter category so that constitutionally the provinces are responsible for radiation safety. This responsibility is however no longer absolute, following the development of the atomic bomb a Federal Atomic Energy Control Act was passed and this gives the federal government control of developments relating to atomic weapons or nuclear energy. In practice this means that all uses of radioactive materials have to be licenced by the Atomic Energy Control Board (AECB) set up under the Act; and that the licence conditions are worded in a way which usually incorporates a considerable component of occupational health related requirements. Today regulatory responsibility is shared between the federal and provincial governments and to date there has been no supreme court decision which clearly identifies the limits of federal and provincial responsibilities. Nevertheless the courts have decided that even where there are valid federal controls, provinces may constitutionally impose more stringent (but not less stringent) controls enforceable within the territory of the province concerned.

For many years after the Atomic Energy Control Act was passed there was little attempt on the part of either federal or provincial governments to control and inspect users of ionizing radiations, and no provincial government enacted specific radiation control legislation. The need for such legislation first became evident in connection with medical uses of radiation particularly diagnostic radioiology. In Saskatchewan an advisory committee was set up in 1959 under Dr Norman Williams to advise the Minister of Public Health on the need for regulations to control hazards arising from the use of ionizing radiations and on the methods which should be used to enforce such regulations. As a result of the report of this committee the first provincial Radiation Health and Safety Act was passed in 1962, and set an important precedent for public controls on the medical uses of ionizing radiations in Canada. The Act required the appointment of the first provincial radiation safety officer, empowered the introduction of radiation control regulations and established an ongoing Radiation Health and Safety Committee to advise the provincial government on all matters relating to radiation hazards and their control. Over the years this committee has done a great deal to shape the radiation safety policies adopted by the province. The provincial radiation safety unit reports to the committee which is also responsible for periodically reviewing the regulations issued under the act and making recommendations for them to be updated. The Act itself requires all types of radiation emitting equipment to be registered with the provincial government in an analogous way to the federal requirement for the licencing of radioisotope users, sets formal requirements for regular maintenance of all medical radiation equipment and introduces formal training requirements for the operators of this equipment. It has been regularly updated since it was first brought in, the last major revision took place in 1985 and considerably expanded the provisions relating to uses of non-ionizing radiations. Regulations under the Act were first introduced in 1970, primarily to enact the radiation dose limits recommended by the ICRP. Subsequent regulations covered many other areas of concern and last year a comprehensive package of revised regulations, covering all aspects of the use of both ionizing and non-ionizing radiations, was released for public comment.

Medical.

The original responsibilities of the provincial radiation safety unit were primarily directed towards radiation safety inspections of hospital x-ray equipment, and this still remains one of its primary responsibilities as the exposure of patients during medical procedures continues to make by far the biggest contribution to population radiation exposure from man made sources. From the early 1950's onwards such inspections had gradually became general practice in most countries where diagnostic radiology was widely carried out, but initially the function of these inspections was very limited; primarily to look for radiation leakage through the tube housing, check collimation and filtration, and test the adequacy of shielding. Gradually however it became appreciated that protection of patients as well as operators was desirable, and that this involved such considerations as the elimination of unnecessary retake examinations. This has resulted in radiation safety inspections being extended to include checks on many other factors such as the resolution of the system, the speed of the film-screen combination and the optimisation of the processing. Eventually these developments led to recognition that the physicists employed as radiation health inspectors have to provide full medical physics support to all the hospitals which do not have a staff medical physicist on call. Today one of the principal duties of provincial radiation health officers is to help diagnostic radiology departments in small hospitals and clinics to develop mandatory in-house quality assurance manuals that clearly lay down not only the duties of the hospital but also their own role as visiting physicist.

Uranium Mining.

Saskatchewan is a major world producer of uranium from mines with uniquely high grade ores (some localised deposits consist of more than 50% uranium and average ore concentrations of well over 10% are common).

Another major responsibility of the radiation safety unit is therefore to support provincial mines inspectors by visiting uranium mines to enforce both provincial regulations and good working practices. Saskatchewan is the only part of Canada where the internal dose equivalent received from radon daughters and the inhalation of radioactive dust has to be added to the external dose equivalent received from gamma radiation, and the sum has to be less than the permissible occupational dose limit. Provincial radiation health officers are involved in enforcing these dose limits, setting up agreed monitoring schedules for mines and mills, approving proposed work practices, establishing adequate worker training programs and carrying out on-site radiation safety inspections.

Industrial and Educational.

The unit is also involved to a lesser extent with many other industries which employ ionizing radiation techniques. Industrial radiography; density, level and flow gauging; neutron moisture content measurements; tracer studies; oilwell logging and laboratory analysis procedures are well known examples of these techniques. Some of them involve the use of radioisotopes and therefore require Atomic Energy Control Board licences and conformity with A.E.C.B. regulations, others are entirely a provincial responsibility. Staff attached to the radiation safety unit have the responsibility of providing an emergency response service following transport or other radiation emergencies and also participate in education and worker training programs, particularly those directed towards members of the occupational health committees which are mandatory under Provincial legislation in all large workplaces.

Radon.

Today there is increasing public concern about levels of natural radon in buildings and the regulations recently introduced include a requirement that remedial action to correct high radon levels must be carried out in buildings to which the public have access if any person may be exposed to a radon dose exceeding one tenth of the provincial limit for occupationally exposed workers (4 WLM per annum).

Non-ionizing Radiations.

During the last few years the most important change in the work of the unit has been an increasing involvement with problems associated with sources of non-ionizing radiation. The uses of lasers for medicine, industry, education and entertainment is increasing each year and, although there have been few serious accidents, most of these uses involve significant risk of retinal damage. With the proliferation of tanning salons excessive exposures to ultra-violet are becoming increasingly common. Ultrasound and NMR imaging procedures now take place in many hospitals and hearing losses arising from airborne ultrasound are becoming more frequent. Video terminal operators and persons living near electrical transmission lines are concerned about low frequency R.F. emissions, and catering workers about the leakage of microwaves. Regulations to address all these concerns, and to limit possible exposures of the public, were introduced last year and now have to be enforced by the unit.

Laboratory Facilities.

Until recently the radiation physicists attached to the unit were only equipped with field monitoring instruments but with the increasing scope and complexity of the program for which it is responsible the unit has for a long time felt a need for comprenensive laboratory facilities. The first step in this direction was the introduction of thermoluminescence dosimetry 15 years ago, and the development of new quality assurance procedures for diagnostic radiology necessitated the acquisition of a diagnostic X-ray unit six years ago. However the role of the unit as an enforcement agency for provincial regulations remained severely crippled by lack of instrument calibration facilities until 1985 when the unit moved into a new building in which its laboratory requirements could be accommodated. The facilities now available to the unit occupy about 200 sq. m. and include four principal laboratories. The first contains medical and dental X-ray units and a darkroom with automatic film processors, as well as test benches for the calibration of X-ray, gamma ray and microwave oven monitors (all commercial microwave ovens are checked for leakage by public health inspectors, and the monitors used for this purpose are all calibrated by the radiation safety unit at yearly intervals). The second is basically a radioisotope and wet chemistry laboratory, although it also includes a radon chamber in which the radon monitoring instruments are calibrated. A small room off this laboratory is used for alpha and gamma spectrometry and provides a less intimidating setting for such occasional duties as monitoring the thyroids of travellers returning from Europe immediately after the Chernobyl accident. The third laboratory is an open area containing the units computer system and a thermoluminescece dosimeter reader with annealing ovens. The final laboratory is essentially a service area, this can house any special projects but is set up primarily as a maintenance workshop.

Conclusion.

This paper marks the 25th anniversary of the establishment of the provincial radiation safety unit in Saskatchewan, Canada; and it outlines the way in which the activities and responsibilities of the unit have evolved during this quarter century. Stepping back to review the past in this way is valuable when planning to meet likely future committments during a decade in which it seems likely that public concerns about radiation risks will continue to increase.