Brave New Worlds for Nuclear Medicine

In thirty years, Canada has gone from scratch to becoming the world's largest supplier of medical isotopes and radiotherapy units says John Beddoes who heads up that part of Atomic Energy of Canada Ltd (AECL) which sells medical nuclear technology around the world. Beddoes and his team sell Canadian know-how in three main areas – cancer treatment units, industrial sterilizers and isotopes which can be used for diagnosis.

Cobalt Treatment

Pioneering work by Harold Johns, now at the University of Toronto, made it possible to produce the world's first cobalt treatment unit in 1951. AECL also installed the first commercially produced unit in the same year.

Since that first AECL unit was built in 1951 and installed at the Victoria Hospital in London, Ontario, others have been built and sold around the world. Beddoes estimates that there are about 2,500 cobalt treatment units in operation throughout the world, of which 1,400 were built and installed by the Canadian company. And recently, the 3,000th cobalt source was shipped from Ottawa.

Quite apart from the number of units is the quality of the customer. All the cobalt equipment in the mammoth M.D. Anderson cancer complex in Houston was built by the Radiochemical Company of AECL. In total market terms, AECL probably has about 60 per cent of the world market in this one area and has treatment units operating in 80 countries worldwide.

After getting production of the cobalt treatment units off the ground, AECL started to look around for other uses for the cobalt being produced by the research reactors. AECL also has an agreement with the largest operator of CANDU equipment, Ontario Hydro, that it will buy cobalt from them.

Sterilizing Plants

In the last 20 years, many industrial uses have been developed. The most important of these are large sterilizing plants. Here, equipment destined for sterile use in hospitals and medical centres passes through cobalt units and, in the process, receives doses of radiation which are lethal to bacteria and viruses.

Of 70 large industrial units now in use, AECL has built 48. "Our nearest competitor has built seven, so you get some idea of the lead Canada has here. I think we could claim to have the major market share in over 20 countries," said Beddoes.

Impressive though these figures undoubtedly are, they pale in comparison to what could be a monumental leap forward. Similar sterilizing units using cobalt could change all of our lives and go a long way to easing the world food shortage.

Beddoes warms to the subject as he continues. "The major new application for this industrial technique in the '80s is probably going to be the irradiation of food to stop spoilage.

The World Health Organization estimates that as much as 30 per cent of the world's food is not eaten because it spoils before it gets to the table. So there could be a huge world-wide market for this type of technology – particularly in warm areas of the world where spoilage is a very big problem.

Isotopes

The third major activity of the Radiochemical Company is the shipping of isotopes to customers throughout the world. Here again, Canada is the world's largest supplier – with between 50 and 60 per cent of the global market. "We supply the raw isotopes to manufacturers in various countries who break them down into the 'retail' products which end up in medical units," explained Beddoes.

If there is a problem for AECL in this area, it is one of logistics. Isotopes have very short lifespans. The most widely used one, Molybdenum 99 (Mo 99) has a half life of 67 hours. "So we don't have much time to produce it, assure ourselves it is medically pure and not contaminated by other isotopes, and ship it to all parts of the world."

Most of the isotopes produced for export today are made by reactors. With cyclotrons – particularly the TRIUMF facility in Vancouver – starting up, AECL is gearing up to distribute products from these new units to major markets. Many of these newer isotopes have great medical potential because many of them are less toxic, and can be easily incorporated or attached to other agents. These newer isotopes, when combined with other technology like the brain scanner, are leading to machines undreamed of even 10 years ago.

AECL is collaborating with the Montreal Neurological Institute in the development of a machine that will show investigators not only what a slice across the brain looks like, but what is going on inside that slice. In other words, an incredible new field is opening up which will allow doctors to study the biochemistry of the brain – and, of course, many other organs.

"These newer isotopes are now just beginning to be used in medicine."

Beddoes pauses for another, admittedly smaller moment as he says, "I believe the technology we have here will keep us in the forefront of the medical world."

Hospital uses magnesium for heart attack victims

Heart attack victims at the Ottawa Civic Hospital will be treated with magnesium, a mineral which scientists now believe protects against heart disease and possibly even the mysterious crib death.

Dr. Brian Morton, a cardiac pathologist with the Civic, says patients suffering heart attacks will receive the mineral intravenously in hopes it will minimize damage to the heart muscle and possibly speed recovery.

He said up to 200 patients could be tested in a year-long research project, probably the first of its kind in Canada.

The experiment stems from growing evidence among scientists that an inadequate source of magnesium may contribute to heart disease – the leading cause of death in North America.

Magnesium is found in hard water. Whole grain and liver also provide good sources of the mineral although researchers think many diets may be deficient in essential minerals.

Scientists do think that hard water with its abundance of minerals is connected with a lower incidence of heart disease.

A report by the National Research Council on water hardness and human health research shows the heart disease rate in North America and Britain ranges from 15 to 76 percent higher in soft-water areas compared with hard-water areas.