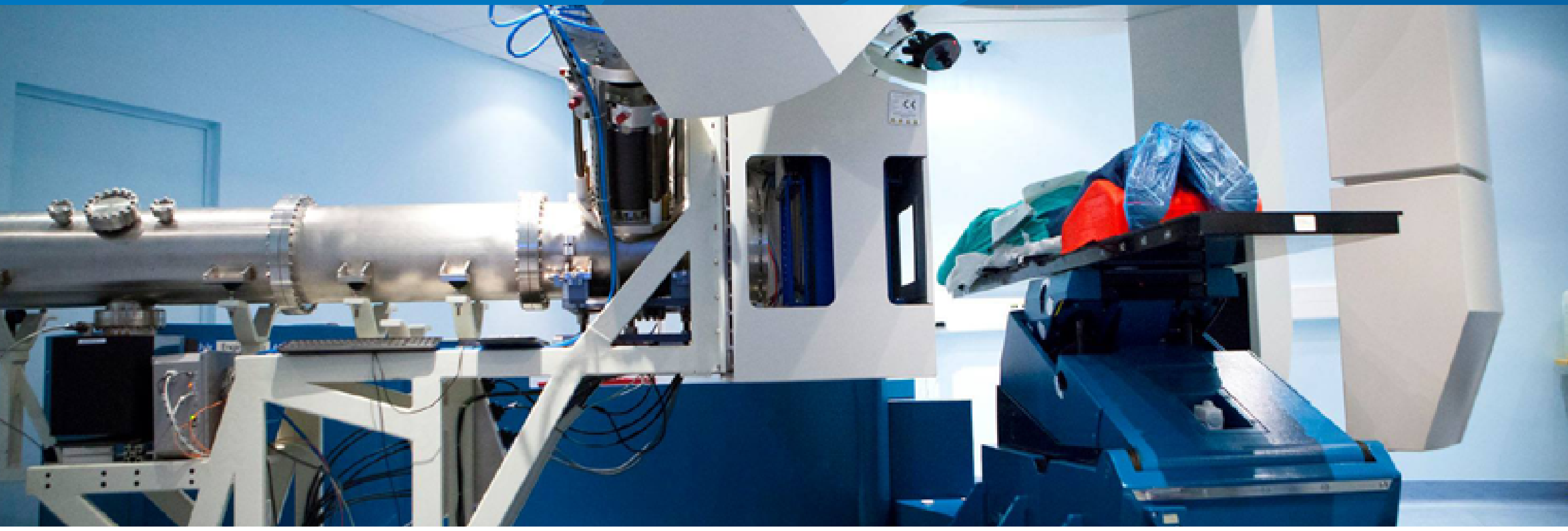
National Particle Treatment and Research Centre



Offering the latest medical therapy for difficult-to-treat cancers

Representatives from leading Australian hospitals, research centres, universities and industry are proposing the establishment of a new National Particle Treatment and Research Centre to deliver advanced cancer treatment based on a leading-edge technology—carbon ion therapy. This will improve patient outcomes in cancer therapy and take Australia into the community of nations adopting this advanced approach.

There is a significant group of Australians with cancer today and in the future who could benefit from treatment with carbon ions. This form of particle therapy offers hope to those who cannot be treated with current approaches.

The use of accelerated carbon ions, a technique which delivers a precisely-targeted dose of energy with minimal side effects, has the potential to improve patient health outcomes and quality of life during treatment and after treatment.

In addition to making a sustained commitment to improving the health of Australians by providing world-leading cancer treatment, the National Particle Treatment and Research Centre will boost Australian health research and deliver innovation in the physics, biology, and associated technologies that underpin carbon therapy.

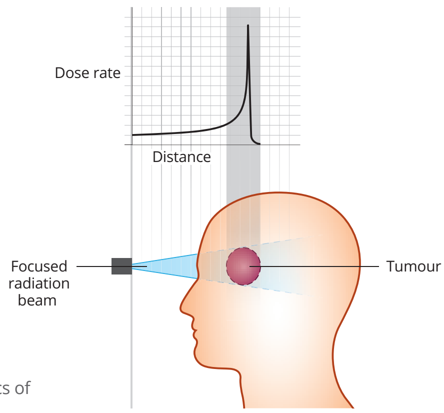
Clinical advantages

Carbon ion therapy is part of the latest generation of cancer treatment that demonstrates advantages over conventional radiation therapy using X-rays[1] and another particle therapy using protons.[2] Accelerated carbon ions have unique physical and radiobiological properties which give them superior clinical advantages. Being a heavier particle than a photon (X-ray) or proton, carbon ions deliver a higher dose of radiation which increases with depth to a sharp energy peak which can be postioned precisely at the location of the tumour.

Due to the physical manner in which the carbon dose is delivered at the cellular level, carbon ions are associated with an enhanced relative biological effectiveness (RBE), which means they can be up to three times more effective at killing cancer cells in a tumour than conventional X-rays.

And by depositing maximum energy to a cancer site with little diffusion to healthy tissue, side effects and the risk of secondary tumours are reduced. The energy of the carbon ion beam can be controlled precisely and manipulated to match the size and shape of the tumour.

Carbon ion therapy addresses cancers that are located next to critical structures, such as the eye, or tumours that are resistant to conventional radiation treatment.



Depth-dose characteristics of carbon ion particle.

The Heidelberg Ion Therapy Center (HIT), Heidelberg Germany.

Current research is focused on reducing the number of treatments (fractions) required with carbon ions—greatly reducing treatment time and increasing the capacity and economics of treating more patients in a single facility.[3]

A better long-term solution

It is essential that Australia invests in innovative, translational research to reduce the impact of cancer and the future burden on our health care system.

Cancer is the major cause of illness and a leading cause of death in Australia. One in two Australians will develop a malignancy in their lifetime and one in five will die from cancer before the age of 85.[4]

There is growing global interest in and commitment to carbon ion therapy as evidence of cost-effectiveness and patient outcomes accumulates.[5]

Global prominence for Australia

In addition to saving and improving lives, a national centre would develop and lead a collaborative national network for clinical practice, education and research using heavy ions.

An opportunity exists for Australia to join an international network of collaborative research centres, whose investigations in medicine, biology and physics, have applications in many high-technology industries.

The National Particle Treatment and Research Centre is expected to generate clinical trials, further medical research on the interaction of radiation with living matter, lead to improvements in particle therapy techniques and become a centre for advanced training and education.

The technological infrastructure that is the basis of the facility is a versatile synchrotron accelerator which would produce carbon ions and could also generate other therapeutic particles, such as other heavy ions and protons.

The potential cost-efficiency of carbon ion therapy is based on the possibility of reducing the number of treatment fractions. Many more patients can be treated than with conventional radiological approaches which generally require 30 separate treatment fractions delivered over several weeks.

Experience in accelerator sciences

The Australian Nuclear Science and Technology Organisation (ANSTO), one of Australia's leading scientific organisations with expertise in the accelerator sciences, is committed to the development. ANSTO operates a range of Australia's key scientific infrastructure that produces accelerated particles, including the Australian Synchrotron, the Centre for Accelerator Science, and the National Imaging Facility Research Cyclotron.

ANSTO has carried out numerous activities to advance the business case for the Centre including, extensive international consultations, preliminary engineering work and indicative costings.

Representatives from Australian hospitals, research centres and universities are supporting the establishment of a new National Particle Treatment and Research Centre. The project also has the support of cancer clinicians across Australia.

The Royal Australian and New Zealand College of Radiologists' Faculty of Radiation Oncology, has stated in a position paper that 'patients in Australia and New Zealand should have access to particle therapy among other radiological treatments' and 'it supports an investigation of the establishment of a carbon ion treatment facility'.[6]

The project also has a commitment from a diverse range of potential service partners and stakeholders.

The Westmead precinct in Sydney is ideally placed to host the Centre as part of its redevelopment.

References

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