Lausanne University Hospital and CERN collaborate together on a pioneering new cancer radiotherapy facility

Lausanne University Hospital (CHUV) and CERN, in Switzerland, are collaborating to develop the conceptual design of an innovative radiotherapy facility, used for cancer treatment. The facility will capitalise on CERN breakthrough accelerator technology applied to a technique called FLASH radiotherapy, which delivers high-energy electrons to treat tumours. The result is a cutting-edge form of cancer treatment, highly targeted and capable of reaching deep into the patient's body, with less side-effects. The first phase of the study comes to a conclusion this September.

In radiotherapy, the FLASH effect appears when a high dose of radiation is administered almost instantaneously - in milliseconds instead of minutes. In this case, the tumour tissue is damaged in the same manner as with conventional radiotherapy, whereas the healthy tissue appears to be less affected, meaning that less side effects are expected.

This advantage of FLASH therapy was recognised at CHUV, which pioneered development of the field. "In 2018, CHUV showed complete disappearance of a tumour in a resistant superficial skin cancer, with nearly no side effects. This first for FLASH treatment on humans accelerated the clinical translation of FLASH therapy," explains Prof. Bourhis, Head of Radiation Oncology at CHUV.

CERN and CHUV, co-owners of the technology, aim to conclude a partnership to translate the conceptual design into building plans for the new proposed FLASH facility.

FLASH radiotherapy has other potential advantages: it administers the therapeutically required dose of radiation in a handful of sessions each lasting less than a second, rather than in the conventional multiple sessions of a few minutes.

The main challenge is obtaining high-energy electrons using compact linear accelerators, a challenge now overcome by the collaboration between CERN and CHUV. The solution comes from the conceptual design of a unique apparatus based on the CLIC (Compact Linear Collider) accelerator technology, which will accelerate electrons to treat tumours up to 15 to 20 cm in depth.

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"Using the CLIC high-performance linear electron accelerator technology, we designed a facility which is capable of treating large and deep-seated tumours in the very short timescales needed for FLASH therapy," explains Walter Wuensch, project leader at CERN. The new facility will be compact enough to be installed in existing hospitals.

"Particle physics sits at the interface between fundamental science and key technological breakthroughs. The collaboration between CERN and CHUV demonstrates again how CERN technologies, unique facilities, and expertise can benefit society beyond their use for our fundamental research," says Frédérick Bordry, CERN's Director for Accelerators and Technology and Chair of the CERN Medical Applications Steering Committee.

"CHUV is centred on clinical excellence and patient-centric care. These values, together with the unique opportunities for development and innovation that the region offers, allow us to achieve great breakthroughs. We are particularly proud of our collaboration with CERN and strongly believe in the advancement of FLASH radiotherapy into a clinical setting," commented Prof. Philippe Eckert, CHUV Director General.

The FLASH project is generously supported by the Foundation for the Support of Research & Development of Oncology (FRSDO) and by the Foundation ISREC through a donation from the Biltema Foundation.

Additional information

On 15th September 2020 at 15:00, CERN in collaboration with the CHUV is organizing an online Q&A with the media, in English, during which Prof George Coukos, head of the department of oncology UNIL CHUV and Prof Jean Bourhis, head of the radiation oncology at CHUV will answer questions from the local and international press. Registration is mandatory for all media representatives.

If you are interested in attending this Q&A session, please register by sending your full name and media organisation at press@cern.ch by 12 noon CEST, Tuesday, 15 September. Those who have registered successfully will receive connection details by email and a copy of the release under embargo.

On 16th September 2020, from 18:00 to 19:30, the CHUV is organizing a public conference on radiotherapy, in French, during which several speakers will explain how recent discoveries contribute to a more effective and better-tolerated radiotherapy. Registration is mandatory for all participants. The event will also be broadcasted on YouTube.

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Call for partners

At the forefront of these developments, the CHUV now wishes to develop a collaboration with one or more private partner(s) as a world first and will launch an appeal by December 31, 2020. The objective is to finance the development and implementation of the clinical transfer of the FLASH therapy. If you have any questions or require any further information, please do not hesitate to contact the office of Prof. Jean Bourhis, by email: FLASHtherapy@chuv.ch

About Lausanne University Hospital (CHUV)

Lausanne University Hospital is one of the five university hospitals in Switzerland, with Geneva, Bern, Basel and Zurich. With its 16 clinical and medico-technical departments and their numerous services, CHUV is renowned for its academic achievements in health care, research, and teaching.

The FLASH therapy team of CHUV is a multidisciplinary alliance of fundamental physicists, medical physicists from the Institute of radio physicists, biologists, radiation oncologists and oncological surgeons. It is led by Pr Jean Bourhis, head of radiation oncology.

The Service of radiation oncology is part of the Department of oncology UNIL - CHUV bringing together cancer research and clinical practice to develop advanced therapeutic options and offer patients a direct access to innovation.
The department led by Pr George Coukos is home to the Lausanne branch of the Ludwig Institute for Cancer Research.

About CERN

CERN, the European Organization for Nuclear Research, is one of the world's leading laboratories for particle physics. The Organization is located on the French-Swiss border, with its headquarters in Geneva. Its Member States are: Austria, Belgium, Bulgaria, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Israel, Italy, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Spain, Sweden, Switzerland and the United Kingdom. Cyprus and Slovenia are Associate Member States in the pre-stage to Membership. Croatia, India, Lithuania, Pakistan, Turkey and Ukraine are Associate Member States. The European Union, Japan, JINR, the Russian Federation, UNESCO and the United States of America currently have Observer status.

Scientists at CERN, home of the largest particle collider accelerator, use some of the most complex, bespoke instruments and technologies to study the basic constituents of matter. Often the scientific and technological advancements originated at CERN will find applications outside particle physics. Advancements in accelerators, detectors and computing have had a long-standing contribution in fields as varied as medical imaging, hadron therapy, and in the production of innovative medical radioisotopes.

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