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The Jules Bordet Institute: A Leading Oncology Center

The Institute Jules Bordet (IJB), part of the Brussels University Hospital (HUB), is a renowned oncology center in Europe. Known for its multidisciplinary approach to cancer treatment, the institution integrates clinical care, research, and education to provide comprehensive and patient-centered care.

The Radiation Oncology Department at the Jules Bordet Institute is at the forefront of radiotherapy advancements. A major focus of its research is optimizing the **therapeutic ratio**—balancing maximum tumor cell destruction with minimal damage to surrounding healthy tissue. In recent years, one of the most promising breakthroughs in this field has been the development of **FLASH radiotherapy (FLASH-RT)**, an innovative treatment approach that could redefine cancer care.

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FLASH Therapy: A Revolution in Radiotherapy

FLASH radiotherapy is a cutting-edge technique that delivers ionizing radiation at ultra-high dose rates—thousands of times higher than conventional radiotherapy. Unlike traditional treatments that require multiple sessions over weeks, FLASH therapy can be completed in a

single session lasting just a few milliseconds.

Despite its rapid execution, FLASH-RT has shown comparable efficacy in tumor cell destruction while significantly reducing radiation-induced damage to healthy tissues. By lowering normal tissue toxicity, this approach addresses one of the greatest challenges in modern radiotherapy, ultimately improving patient outcomes and quality of life.

The potential of FLASH therapy lies in its ability to revolutionize radiation oncology by reducing side effects associated with traditional treatments. If successfully integrated into clinical practice, it could become the new standard of care.

Ongoing Research and Future Prospects

To fully harness the potential of FLASH radiotherapy, the Jules Bordet Institute has launched a comprehensive research program that includes **physical, radiobiological, and clinical developments**. Supported by state-of-the-art facilities, this multidisciplinary initiative aims to address the key challenges of transitioning FLASH therapy from experimental studies to routine clinical practice.

Advancements in Medical Physics

Our medical physics team is actively developing and testing new detectors specifically designed for high-dose-rate beams. In collaboration with industry partners, these advancements are essential to ensuring accurate and reliable dosimetry, a crucial factor for the safe application of FLASH therapy in clinical settings.

Radiobiological Research

On the radiobiology front, we are investigating how the **beam structure**—including specific physical parameters—affects the induction of the FLASH effect. This research involves numerical simulations and *in vivo* experiments using various animal models, including mice and zebrafish. Understanding the underlying mechanisms of the FLASH effect is vital to optimizing treatment protocols.

The LANCE Clinical Trial

The upcoming **LANCE trial**, led by Dr. Antoine Desmet at the Jules Bordet Institute, represents a significant milestone in the clinical application of FLASH therapy. This multicenter, randomized Phase II study will evaluate the efficacy and safety of FLASH radiotherapy compared to conventional radiotherapy for patients with localized cutaneous squamous cell carcinoma (cSCC) or basal cell carcinoma (BCC).

Patients with **small lesions (T1)** will receive a single radiation dose of **22 Gy**, while those with **larger lesions (T2)** will follow a fractionated schedule of **5 x 6 Gy**. The results of this trial will be crucial in determining whether FLASH therapy can be safely integrated into clinical practice as a standard cancer treatment.

Conclusion

The research program on FLASH radiotherapy exemplifies the multidisciplinary innovation at the Jules Bordet Institute. By integrating expertise across scientific and medical disciplines, the institute continues to advance cancer treatment and remains committed to developing therapies that enhance patient care.

This pioneering approach reflects our dedication to improving the effectiveness and safety of cancer treatments, reinforcing our position as a leading oncology research center in Europe.