

## From cancer diagnostics to cancer therapy

SCK•CEN sets up NURA, a nuclear medical centre of excellence. “With NURA, we will carry out ground-breaking research into radiopharmaceuticals for the treatment of different types of cancer, commissioned by clinical and industrial partners”, announces project leader Dennis R. Elema. With the creation of NURA, SCK•CEN is shifting into high gear in the fight against cancer.

Each year, more than 65,000 Belgians are diagnosed with cancer. This figure is expected to rise, and by 2025, the counter should reach almost 80,000 Belgians. Nuclear medicine has reached a tipping point. “So far, radioisotopes are used frequently in nuclear medicine for diagnostics purposes. The radioactive substance administered to the patient circulates with carrier molecules throughout the body and accumulates in diseased cells. The radioactive substance lights up under isotope scanning. This makes it possible to detect and locate aberrations. Over the past few years, we have been noticing that targeted treatments are on the rise and the need for therapeutic radioisotopes is therefore high”, explains project leader Dennis R. Elema.

In targeted radionuclide therapy, a carrier molecule brings a radioactive isotope very accurately to the cancer cells. As soon as the molecule attaches to the cell, the radioactive isotope can irradiate the cancer cell. The aim is to reach and disrupt the cell's DNA. “The tumour shrinks and will ultimately die”, explains Dennis R. Elema. The use of therapeutic radiopharmaceuticals is expected to grow. “It is the next big thing in the fight against cancer”, says Dennis. This represents an enormous growth potential for SCK•CEN, which has been contributing considerably to the fight against cancer for quite some time. “We have the knowledge, infrastructure and unique raw materials available to develop new radiopharmaceuticals. This means we have all the necessary assets in hand to reposition ourselves, target our efforts more on therapeutic radioisotopes and as a result increase our contribution in the fight against cancer. We want to help patients keep their illness under control and even heal”, says Dennis. Therefore, SCK•CEN is setting up NURA, which will enable it to grow into a nuclear medical centre of excellence.

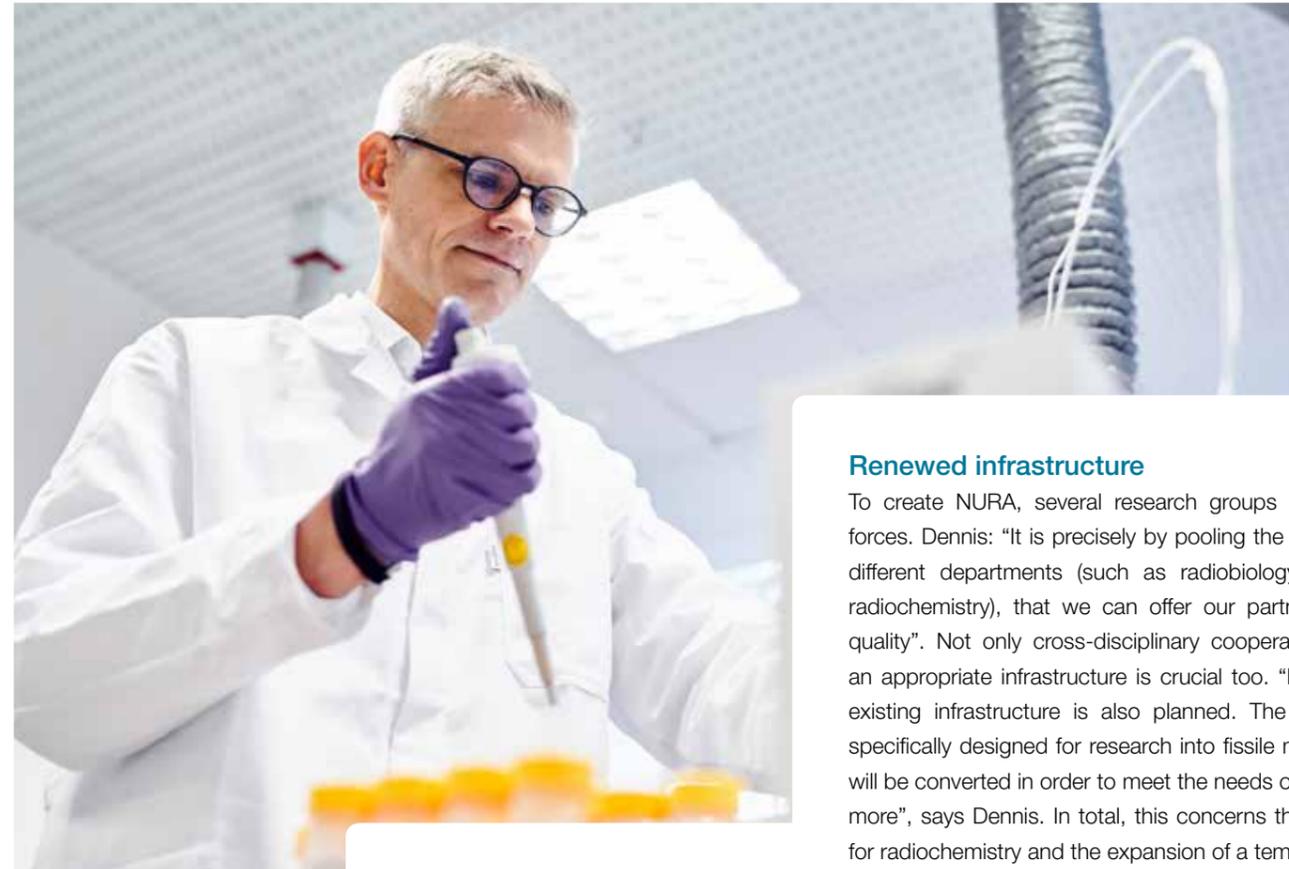
“Therapeutic radiopharmaceuticals are ‘the next big thing’ in the fight against cancer.” ”

### Triple role

NURA has a threefold function. First of all, as a 'Contract Research Organization (CRO)', it will support clinical and pharmaceutical partners in the research into and development of promising radiopharmaceuticals for therapeutic purposes. "We focus on all stages prior to clinical trials and, as such, offer support in the first phases of the development chain", explains Dennis. "In a first phase, we mark a new candidate carrier molecule with a radioactive isotope. Then, we identify the most promising candidate and carry out several tests on this carrier molecule: in vitro tests whereby we let the carrier molecule and cancer cell interact in a test tube, as well as in vivo trials, whereby we test the behaviour of our radiopharmaceuticals. This research is necessary before we can start testing the pharmaceutical on humans."

In addition, NURA has the ambition to act as a 'Contract Manufacturing Organisation (CMO)'. "We want to become a stable supplier of therapeutic isotopes. Because everything happens in-house, we can offer our clinical partners and pharmaceutical companies a guaranteed superior quality of the development process", says Dennis R. Elema.

Finally, with NURA, SCK•CEN wants to strengthen research into medical applications of radioactivity in the existing research groups. Part of this research focuses on radiolabelling, whereby the radioactive nuclide is coupled to a carrier molecule with the purpose of imaging or attacking the tumour. "A one-size-fits-all approach does not work. Each type of cancerous cell has its own receptors, for which we must develop targeted carrier molecules", Dennis explains. In its research activities, SCK•CEN also focuses in particular on long-term effects of cancer treatment with therapeutic radiopharmaceuticals. The aim is to target the tumour specifically and reduce side-effects considerably – both short-term and long-term."



### Less collateral damage

SCK•CEN puts its money where its mouth is. "In the BR2 research reactor, we are currently already irradiating targets for the production of lutetium-177. This beta-emitter is frequently used in hospitals for cancer treatment", says Dennis. "New treatments are also being developed. These treatments are based on the new, very promising, alpha-emitter Ac-225. NURA will also take care of its production", Dennis explains. SCK•CEN will subject the actinium-225 to very stringent quality tests, to make sure it meets the requirements of pharmaceutical partners. Radioisotopes such as rhenium-188 and terbium-161 are also promising. "This is the next generation of radioisotopes coming into the picture for production in the BR2 research reactor. With these isotopes, we can treat several types of cancer", explains Dennis.

### Renewed infrastructure

To create NURA, several research groups at SCK•CEN join forces. Dennis: "It is precisely by pooling the knowledge of our different departments (such as radiobiology, dosimetry and radiochemistry), that we can offer our partners this superior quality". Not only cross-disciplinary cooperation is important, an appropriate infrastructure is crucial too. "Renovation of the existing infrastructure is also planned. The current labs are specifically designed for research into fissile materials and they will be converted in order to meet the needs of pharmaceuticals more", says Dennis. In total, this concerns three research labs for radiochemistry and the expansion of a temporary pre-clinical lab. "We will also build a large facility for pre-clinical trials. Construction for this building is planned in 2021. We will use it to conduct all in vitro and in vivo tests."

### Job opportunities

The NURA project that is about to leave the starting blocks is a huge project. "A project of this magnitude also creates job opportunities", explains Dennis. "Everyone who joins the NURA team at SCK•CEN contributes to the fight against cancer. With the new generation of therapeutic radiopharmaceuticals we are currently developing, we want to improve and optimise treatment for cancer patients. Ever heard of a more noble cause?"

*“ Because everything happens in-house, we can offer our clinical partners and pharmaceutical companies guaranteed superior quality. ”*