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3D RADIOTHERAPY INCREASES EFFECTIVENESS AND SAFETY OF CANCER TREATMENT IN TANZANIA

3D 放射治療提高坦桑尼亞癌症治療的有效性和安全性

Tanzanian doctors are now able to deliver more precise radiation treatment for cancer patients with less damage to healthy tissue. Following training and support from the IAEA in 3D radiotherapy planning, patients will have access to more effective and safer cancer care.

"Being as accurate as possible when irradiating a tumour is essential. We now have the skills to more fully understand the extent of a tumour and ultimately plan better and more precise treatment for our patients," said Mark Mseti, a radiation oncologist at the Ocean Road Cancer Institute in the capital Dar es Salaam, which

報告摘要(KEY INFORMATION)

1. 透過國際原子能總署進行 3D 放射治療的培訓之後，坦桑尼亞(TANZANIA)醫生現在能夠對癌症患者提供更精確的放射治療，使患者獲得更有效和更安全的癌症護理。
2. 日本正與國際原子能總署提倡使用核技術的方法來測試材料的質量，用以檢查建築物在受地震和其他自然災害後的結構完整性。
3. 尚比亞(Zambia)自 1969 年以來一直是國際原子能總署的成員國，其 2016 - 2021 年「國家計劃框架」確定了五個優先領域：1.農業和糧食安全 2.人類健康 3.輻射和廢棄物安全 4.核科學和教育 5.能源
4. 國際原子能總署之會員國正在接受總署在使用新方法和技術方面的建議，加速除役舊核設施和修復受污染之場址。
5. 布加納法索(Burkina Faso)近期在西非成立了最大的昆蟲飼養設施，採用了核技術來防止采采蠅(一種對人類和動物都有害的昆蟲)造成的災害。
6. 2017 年 1 月 23 日至 25 日，多國設計評估計劃（MDEP）指導技術委員會（STC）舉行了一次會議，分享其計劃的結果，並就新反應器設計許可的相關活動作出介紹。
7. 核創新（NUCLEAR INNOVATION 2050）諮詢小組主席於 2017 年 1 月 17 日開會討論該計劃 2017 年的預期實際成果。與會者短期觀點主要注重於現有創新技術的測試，驗證，資格和許可。

receives technical support and equipment through the IAEA. He participated in a recent IAEA training on 3D planning for target volume definition and contouring for radiotherapy (see The Science box). This is part of Tanzania's shift from 2D to 3D radiotherapy planning services that will be implemented in the future after the opening of the country's first facility equipped with 3D planning tools.

"The concept of target volume definition and contouring is about making sure that the radiation we use is focusing on the disease and not on healthy tissue," explained Mseti. "If you can obtain accuracy in drawing, or contouring, the tumour, you will have a higher probability of targeting and obtaining the goals of treatment, while sparing as much of the healthy, normal tissues as you can."

Cancer is the uncontrolled division of abnormal cells in the body, and radiation can be used to stop that division. Specific doses of radiation can damage cells beyond repair, causing them to stop dividing and die. This makes radiation effective for managing and treating cancer. However, if the radiation is imprecisely or improperly targeted or delivered at the wrong dose level, the patient's healthy cells can be unnecessarily damaged, or the cancer cells may only be partially eliminated, leaving other cancer cells to continue dividing. This could put the patient at risk of health complications in the short or long term.

The IAEA supports its Member States, like Tanzania, in working to reduce the burden of non-communicable diseases like cancer. To this end, the IAEA offers training, coordinates research, provides equipment and technical expertise and hosts scientific fellows, among other services. Like Tanzania, many low and middle income countries are only beginning or planning to begin using 3D cancer treatment tools.

"Radiation oncologists in low and middle income countries are sometimes limited to primarily theoretical training due to economic and resource constraints that make it difficult to access often costly hands-on courses," said Eduardo Zubizarreta, Head of the Applied Radiation Biology and Radiotherapy Section at the IAEA. "Helping doctors get the equipment they need and get expert-led, hands-on experience is essential to improve the quality of treatment."

In Tanzania, radiation oncologists have been using paper and a needle to contour in 2D, which is much less precise than the 3D method. "In my three years of training as a radiation oncologist, I had never actually contoured in 3D," Mseti said. "Everything has been theories, theories, theories. I am now ready to use these new contouring skills on patients."

The new facility, set to open in the near future at the Ocean Road Cancer Institute, will be

equipped, in part through IAEA support, with new 3D planning equipment, including a computed tomography (CT) machine. The Institute is expected to treat between 100 and 200 patients per day using these new tools.

JAPAN TO SUPPORT USE OF NDT TECHNOLOGY FOR RECOVERY FROM EARTHQUAKES, FLOODS IN ASIA AND THE PACIFIC

日本支持使用 NDT 技術從亞洲和太平洋的地震及洪水中復原

Japan is contributing US$ 725,200 towards a new IAEA initiative to use nuclear technology for the verification of the integrity of buildings following earthquakes and other natural disasters. The donation, made earlier this month, is channelled through the IAEA Peaceful Uses Initiative.

Following an earthquake or flood, critical civil structures, even when they remain standing, may have developed hidden flaws, which could pose further risks if not detected early and remediated quickly. Industrial testing using nuclear technology involves the use of ionizing radiation – along with other methods – to test the quality of materials, without causing any damage to them or leaving any radioactive residue. Such non-destructive testing (NDT) was successfully used in the aftermath of the devastating earthquake in Nepal in April 2015 to test the integrity of critical buildings such as hospitals, schools and historical attractions.

"NDT technology allows countries to quickly and efficiently test structures using simple and easily portable equipment," said Joao Osso Junior, Head of the Radioisotope Products and Radiation Technology Section at the IAEA. "It can help countries that are particularly prone to natural disasters."

The new activity will complement ongoing IAEA work under a technical cooperation project to support the preparation and recovery of civil infrastructures following natural disasters in Asia and the Pacific. Experts from countries in the region will be offered training and, when needed in the aftermath of a disaster, NDT equipment.

Japan's contribution will include the organization of training courses and storage of equipment at the IAEA Response and Assistance Network (RANET) Capacity Building Centre (CBC)

in Fukushima prefecture, which was opened in 2013. The IAEA has since conducted training activities at the RANET CBC for local, national and international participants to prepare for response to nuclear and radiological emergencies. Now the scope of training activities will be expanded to include NDT technology.

The Malaysian Government, which hosts an IAEA collaborating centre on NDT, has also contributed towards this new initiative. Read more about the country's success in introducing NDT technologies with the help of the IAEA in this article Non-Destructive Testing Helps Malaysia's Competitiveness.

NDT methods include radiography, a type of radiation technology, and gamma tomography, which is based on the differential absorption in different materials of gamma rays emitted from a radioactive source. Through the measurement of the rays that pass through the material without being absorbed, its make-up and structure can be identified. These techniques are able to identify structural defects that cannot be discovered through traditional testing methods.

ZAMBIA SIGNS ITS FOURTH COUNTRY PROGRAMME FRAMEWORK (CPF) FOR 2016–2021

尚比亞簽署了 2016-2021 年第四個國家計劃框架（CPF）

Honourable Professor Nkandu Luo, MP, Minister of Higher Education and Mr Dazhu Yang, IAEA Deputy Director General and Head of the Department of Technical Cooperation, have signed Zambia's Country Programme Framework (CPF) for the period of 2016–2021 on 22 December 2016 and 9 January 2017 respectively. The CPF was handed to the Minister on behalf of the IAEA by the Programme Management Officer, Mr Muhammed Lameen Abdul-Malik, at an official ceremony in Lusaka on 1 February 2017.

A CPF is the frame of reference for the medium-term planning of technical cooperation between a Member State and the IAEA. It identifies priority areas where the transfer of nuclear technology and technical cooperation resources will be directed to support national development goals

Zambia has been an IAEA Member State since 1969. Its 2016–2021 CPF identifies five priority areas:

1. Agriculture and Food Security
2. Human Health
3. Radiation and Waste Safety
4. Nuclear Science and Education
5. Energy

IAEA PUSHES FORWARD INITIATIVE TO ACCELERATE NUCLEAR CLEANUP EFFORTS WORLDWIDE

國際原子能總署加速推動全球核子設施回復工作

An IAEA initiative to help Member States step up efforts in decommissioning old nuclear facilities and remediating contaminated sites is shifting into higher gear this year.

With many reactors reaching the end of their lifetime in coming decades, Member States are looking to the IAEA for advice in using new approaches and technologies. A group of experts from eight countries met in Vienna last week to begin the preparation of comprehensive, IAEA assistance programmes to accelerate clean-up projects across the globe.

The experts prepared initial materials and planning tools for the development of decommissioning and environmental remediation (D&ER) strategies, including for effective stakeholder involvement and human resource capacity building.

The meeting, part of the second phase of the CIDER (Constraints to Implementing Decommissioning and Environmental Remediation) project, laid the groundwork for an annual IAEA technical meeting in May. Member States facing D&ER liabilities will use that meeting to further develop the materials produced and to establish communities of practice. Once developed, these tools could be used by Member States directly or through the assistance provided by the IAEA technical cooperation programme, aligned with national, regional and/or international arrangements.

"In Brazil, we are embarking on a new project to remediate the site of a major uranium mining and milling facility that is no longer operational," said Danielle Eisemberg from Indústrias Nucleares do Brasil S.A. of Brazil. "This is a big and complex endeavour and we have many

issues to solve to enable its implementation. The CIDER II project will help us find ways to address them."

Decommissioning is the last phase in the life cycle of nuclear facilities. It includes all activities needed to remove them from regulatory control and make the sites available for other uses. Environmental remediation, involving measures to reduce radiation exposure, is required when sites are contaminated as a result of operations that did not conform to adequate regulatory requirements or were affected by a nuclear accident or radiological emergency.

Many Member States have implemented successful D&ER projects. Several others have initiated them but have faced technical, social and political constraints, which have impeded their progress. The IAEA's CIDER project was designed in 2013 to identify those constraints and suggest mechanisms that could improve levels of implementation of D&ER projects.

The reasons for slow progress in a number of D&ER projects worldwide often include financial constraints, but also a lack of national policy, inadequate regulatory frameworks and insufficient access to relevant technologies and qualified staff.

"Better overall strategies for D&ER, enhanced legal and regulatory arrangements as well as improved stakeholder engagement practices are needed," said Oleg Voitsekovych from the Ukrainian Scientific and Research Institute for Hydrometeorology. "We hope that CIDER II may create the synergy to increase the effectiveness of technical assistance Ukraine receives from the international community in this area."

Decommissioning using advanced technologies

Also last week, 110 participants from 25 countries gathered in Sarpsborg, Norway, to discuss current and emerging technologies that could improve decommissioning practices. Nuclear operators, regulators, scientists, consultants and contractors exchanged information and views on research and development and application of advanced technologies for nuclear decommissioning. The workshop was organized jointly by the IAEA and the OECD Nuclear Energy Agency.

"Demonstration of advanced computer-aided technologies provided participants with an overview of progress in support of decommissioning planning," said Nils Morten Huseby, CEO of the Institute for Energy Technology (IFE). Jon Kvalem, Deputy Project Manager of OECD Halden Reactor Project added that sharing experience and demonstration of techniques is useful for many nuclear facilities worldwide, as many decommissioning challenges still have to be addressed.

Christophe Xerri, Director of the IAEA Division of Nuclear Fuel Cycle and Waste Technology, emphasized that CIDER II and the Sarpsborg workshop complement other IAEA activities and delivery mechanisms in the field of D&ER.

"IAEA-supported networks of professionals such as the International Decommissioning Network (IDN) and the Network of Environmental Management and Remediation

(ENVIRONET) provide very useful opportunities for sharing knowledge, information and expertise, the basis of any successful project," he said. The IAEA's current and future activities in this field respond to many issues highlighted at the International Conference on Advancing the Global Implementation of Decommissioning and Environmental Remediation Programmes, held last year in Madrid, he added.

IAEA HELPS BURKINA FASO SCALE UP FIGHT AGAINST TSETSE FLIES

國際原子能總署幫助布加納法索擴大對抗采采蠅的鬥爭

Burkina Faso today inaugurated the largest insect rearing facility in West Africa to apply a nuclear technique to suppress the tsetse fly, an insect harmful to both humans and animals. The plant was built with the support of the International Atomic Energy Agency (IAEA), in cooperation with the Food and Agriculture Organization of the United Nations (FAO), in a move to help control one of Africa's most devastating cattle diseases, Nagana.

The Insectary of Bobo-Dioulasso is a mass-rearing factory that will help the region use the Sterile Insect Technique (SIT) – a form of insect birth control – to reduce tsetse populations.

The SIT uses radiation to sterilize male insects, which are reared in large numbers and released to mate with wild females. Since these do not produce any offspring, the targeted insect population is suppressed over time, or potentially even eliminated.

"The IAEA has been supporting Burkina Faso since the 1990s, when the country pioneered the technique in West Africa to release sterile male flies as a successful control tactic against tsetse," said Aldo Malavasi, Deputy Director General of the Department of Nuclear Sciences and Applications, at the facility's inauguration event attended by Minister of Higher Education, Scientific Research and Innovation Filiga Michel Sawadogo, representing the country's Prime Minister, as well as several other ministers and high level officials.

The facility will be able to produce 300,000 sterile male tsetse flies per week. Through its joint programme with the FAO, the IAEA has trained technical staff to rear, irradiate and release the insect, and has provided technical advice and equipment. The Agency also provided the first colony of flies from its laboratories in Austria and from a partner

laboratory in Slovakia to help Burkina Faso start production.

Combatting tsetse is a major concern in Africa, since its impact on agriculture, livestock and humans considerably hampers development efforts.

The bloodsucking fly kills more than three million livestock in the sub-Saharan continent every year, generating US $4.5 billion in losses annually to the local agricultural industry. Tsetse flies transmit trypanosomosis, a parasite that causes Nagana, a wasting disease in cattle. In some parts of Africa, the fly is also responsible for spreading human "sleeping sickness".

"In certain ecological settings, the SIT can be a key component of tsetse control strategies, complementing other methods such as fly-trapping and insecticides, " Malavasi said.

The inauguration marks an important milestone not only for the country, but also for the effective area-wide management of tsetse flies in West Africa, he added.

Through its technical cooperation programme, the IAEA has been supporting the application of the SIT to manage insect pests around the world for decades through research, training, expertise and equipment. The Agency also supported the successful targeted eradication of tsetse from the Island of Unguja, Zanzibar, and is currently also helping Senegal and Ethiopia reduce their tsetse fly populations.

In May 2017, the Third IAEA/FAO International Conference on Area-Wide Management of Insect Pests will review ways to intensify the application of various control tactics to combat insect pests, including mosquitos that transmit human diseases such as Zika, dengue and malaria.

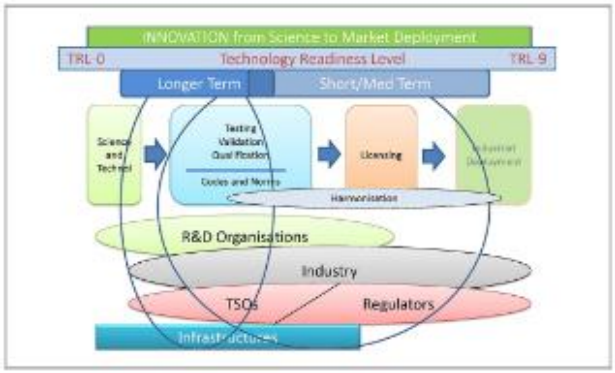
MDEP PREPARES FOR ITS FOURTH CONFERENCE ON NEW REACTOR DESIGN ACTIVITIES

MDEP 為其第四次新型反應器設計活動會議做準備

On 23-25 January 2017, the Multinational Design Evaluation Programme (MDEP) Steering Technical Committee (STC) held a meeting during which each MDEP working group and relevant stakeholders presented updates on their programme of work and ongoing activities. Among the decisions taken, the STC approved the design-specific common position on the VVER design, completing the set of common positions issued on the safety conclusions for each new reactor design and how they could be enhanced to address Fukushima Daiichi-related issues. A large portion of the meeting was dedicated to the preparations for the Fourth MDEP Conference on New Reactor Design Activities, which will be held on 12 - 13 September 2017 in London, United Kingdom. The event will allow the MDEP to gather feedback on its current activities and to discuss its future. It will also provide a forum for MDEP stakeholders, including national regulatory authorities, international organisations, standard development organisations and industry representatives, to share the results of their engagement with the programme and to deliver presentations on ongoing activities related to new reactor licensing.

NUCLEAR INNOVATION 2050 (NI2050) – A ROADMAP TO A SUSTAINABLE ENERGY FUTURE

核創新 2050（NI2050） - 可持續能源未來的路線圖



The Nuclear Innovation 2050 (NI2050) Advisory Panel chairs met on 17 January 2017 to discuss the initiative's expected practical outcomes for 2017. Participants confirmed the vision of the NI2050 as an incubator for the selection and development of large-scale programmes of actions, including R&D and market uptake projects and infrastructures, in order to accelerate the readiness of innovative technologies and help them reach competitive deployment in time to contribute to the sustainability of nuclear energy in the short/medium to long term. Such programmes of actions, once developed at the proper level of maturity, will then be proposed to NEA stakeholders, including member countries, R&D organisations, industry representatives, TSOs and regulators, and possibly financing institutions, for them to discuss ways and means of practical, legal and financial implementation. Shorter-term perspectives will primarily focus on the testing, validation, qualification and licensing of existing innovative technologies for faster and efficient market deployment. For the longer term, actions will focus on the acceleration of research and development programmes, while integrating the already existing attributes of industrial deployment. Read more about the NI2050 at oe.cd/1Mf.