

# IAEA 動態報告

## 2017/4/3- 4/14

### PROTECTING PATIENTS: PROMOTING SAFETY CULTURE IN DIAGNOSTIC IMAGING

在醫學影像檢查中促進患者的安全防護



Unintended and accidental patient exposure to radiation through diagnostic imaging can be significantly reduced by increasing awareness of safe practices, participants at an IAEA meeting heard last week.

“Even though incidents related to unnecessary and extreme exposure conditions are rare, they

#### 報告摘要 (KEY INFORMATION)

1. 來自 25 個國家和數個國際組織參與的輻射防護技術會議中與會者指出，透過提高對安全措施與程序的認識，可以顯著地降低專業人員和患者暴露於輻射事故中。
2. 由於國際原子能總署與歐洲核醫學協會 (EANM) 近期簽署的新協議，發展中國家的核醫學專業人員將可以獲得更多進階培訓課程和龐大數量的教材。
3. 2017 年世界水資源日的主題：「為什麼要浪費水？」強調保護我們有限的淡水資源的重要性。
4. 玻璃固化是高階放射性廢棄物處理的方法之一，國際原子能總署開始支持發展玻璃固化的會員國，並提供國際原子能總署累積的經驗做法和解決方案。
5. 900 多名來自世界多數核電廠國家的官員代表將在國際原子能總署總部召開會議，共同審查彼此在加強核安全方面的相關計畫。
6. 2017 年 3 月 20 日至 22 日，核能署舉辦了一次關於新組織能力與核監管監督的研討會，研討會吸引了來自 15 個國家的 40 多名學者。研討會為參加專家們提供了一個機會，分享其核監管可靠做法和經驗。
7. 2017 年 3 月 22 日，核能署邀請國際 Jules Horowitz 實驗計劃基金會 (FIJHOP) 的專家，討論 Jules Horowitz 反應器 (JHR) 進行的初步實驗與準備工作，以及 NEA 如何促進材料試驗反應器 (MTR) 與科學界的合作。

can be avoided and their severity can be substantially reduced, if imaging procedures are performed appropriately,” said Jenia Vassileva, Radiation Protection Specialist at the IAEA Technical Meeting on Preventing Unintended and Accidental Medical Exposures in Radiology.

Participants at the meeting, which brought together regulators and health professionals from 25 countries and several international organizations, found that accidents and incidents in X-ray imaging typically happen due to lack of awareness among professionals and patients regarding the potential harmful effects of unintended medical exposure. These may be caused by insufficient knowledge of the risks and relevant contributing factors among medical professionals, regulatory and public health authorities.

Over 4 billion radiology procedures are conducted annually worldwide. Medical imaging techniques such as X-ray radiography, Computed Tomography (CT) and image guided interventional procedures, are valuable sources for the diagnosis of several health conditions as well as for guiding treatment. However, experts acknowledge that there may be health risks associated with unintended exposure. These can include skin injuries, hair loss and, in cases of unknown pregnancies, risk to the foetus.

Dina Farag Hussein, a radiologist from the Egyptian Atomic Energy Authority, explained the potential impact of radiation exposure in pregnant women. “Diagnostic imaging requires extreme caution particularly when it is used in female patients who are suffering from irregular menstrual cycles or long standing periods of

infertility,” she said, adding that such patients tend to realise they are pregnant at later stages due to these pre-existing conditions and as a result can be accidentally exposed to radiation in the first 5 to 11 weeks of pregnancy.

Participation from across disciplines was key to the success of the meeting, said Donald Frush, Chair of the Image Gently Alliance, a coalition of health care organizations dedicated to providing safe, high quality paediatric imaging worldwide. “Having all the separate voices here is very important from my standpoint, because you get a dynamic sense of what various professional inputs in areas of expertise are,” he said.

### **The IAEA’s role**

At the meeting the IAEA presented its reporting and learning system for image guided interventional procedures with risks for skin injuries, called Safety in Radiological Procedures (SAFRAD).

“The IAEA will continue to support Member States to implement the International Basic Safety Standards through various actions,” said Vassileva. “Our online platform, Radiation Protection of Patients (RPOP), assists the medical community and patients through various education and training materials. Our free webinars provide opportunities for professionals to participate from anywhere to learn about the latest topics in radiation protection in medicine.”

## ACCESS TO HIGH QUALITY EDUCATION INCREASES FOR NUCLEAR MEDICINE PROFESSIONALS

藉由高質量教育的增加以提升核子醫學專業



More nuclear medicine professionals from developing countries will have access to training courses and educational materials thanks to a new agreement signed between the IAEA and the European Association of Nuclear Medicine (EANM) today.

The IAEA has had a longstanding cooperation with EANM, one of the largest professional organizations in the field of nuclear medicine, with over 9,000 members and a vast network that reaches beyond Europe. “The arrangement signed today will further expand this cooperation, increasing educational opportunities for professionals in nuclear medicine and hybrid imaging,” said Diana Paez, Head of the Nuclear Medicine and Diagnostic Imaging Section at the IAEA.

In nuclear medicine, imaging tests are used to create visual representations of a body’s interior to diagnose a variety of health conditions including non-communicable or chronic diseases, such as cardiovascular diseases and cancer. Hybrid imaging combines information provided through nuclear medicine studies and anatomical details provided through

radiological studies, improving diagnostic accuracy and ultimately patient care.

Under the new agreement, EANM will also provide experts and infrastructure for IAEA training courses and expert missions to low- and middle-income countries, and will work closely with the IAEA on the development of interactive educational materials for the IAEA Human Health Campus.

“The agreement is an incentive for EANM to further improve the quality of education in nuclear medicine,” said EANM President Kristoff Muylle. In response to rising demand for dedicated training in hybrid imaging and new therapeutic applications in nuclear medicine, EANM has recently modernized its educational offering and founded the European School of Multimodality Imaging & Therapy (ESMIT), which will now be open to IAEA-nominated professionals.

### **Benefits the world over**

To date, more than 90 nuclear medicine professionals have benefitted from the on-going cooperation between the two organizations, mostly through IAEA-facilitated trainings in Europe. The conclusion of the agreement, called practical arrangements, will make this cooperation easier and expand its scope, Paez said.

Sergei Nazarenko, Head of the Nuclear Medicine Department at the North Estonia

Medical Centre, has been among the beneficiaries of the cooperation between the IAEA and EANM. He highlighted the diverse challenges that nuclear medicine professionals in different countries face — and where this cooperation can be of major assistance. “Smaller European countries like Estonia have practical challenges because of their size,” he said. “In order to assure availability of knowledge and competences to our local specialists, we need extensive international cooperation like the one just signed.”

The IAEA/EANM webinars developed under the cooperation so far offer a unique tool and a free teaching instrument, said Augusto Llamas Olier, Head of the Nuclear Medicine Department at the National Cancer Institute in Bogota, Colombia. “We hope that this cooperation will ensure that the IAEA and EANM can provide us with ideas and help us increase the impact factor of our research and publications.”

## WORLD WATER DAY 2017: WHY WASTE WATER?

2017 世界水資源日：為何浪費水資源？



The theme of World Water Day 2017 — Why waste water? — highlights the importance of conserving our limited freshwater resources. As more of the world’s population moves to urban areas, water conservation and reuse are ever more critical as part of efforts to provide adequate water and sanitation for all.

At the same time, it is also important that waste water reuse schemes do not lead to an overall

decrease in the availability of water by contributing to the deterioration of water quality in surface and groundwater resources.

Good water quality management is essential to increasing water availability, which is the main aim of Sustainable Development Goal (SDG) 6 ‘Securing Sustainable Water for All’, with associated benefits for improved health, the aim of SDG 3 ‘Good Health and Well-being’. Good water quality is a product of good science and advanced technologies. The IAEA works to strengthen national scientific and technical institutions responsible for water resource management within the SDG framework. Read more on the activities of the IAEA Water Programme in this area.

### How the IAEA helps

Monitoring and management of groundwater pollution is a common and challenging problem for developing countries seeking to improve or better manage water quality. The IAEA builds capacities in Member States to characterize the sources of contamination by using naturally occurring isotopes present in water, mitigate their consequences and establish monitoring networks. Isotopes are important tools for managing water quality and understanding how to optimize wastewater treatment and wastewater recycling.

There are currently 11 ongoing water quality projects, assisting 28 Member States, and 10 new technical cooperation projects have been proposed for 2018-2019. These projects support SDG target 6.6: protect and restore water-related ecosystems, including mountain forests, wetlands, rivers, aquifers and lakes. These projects study and address various impacts of groundwater pollution.

### **Deteriorating water quality in lakes and rivers**

Water quality in lakes and rivers around the globe is deteriorating due to rising nutrient levels and other chemical pollutants, mainly from agriculture and household waste. This results in exponential blooms of some forms of aquatic life, typically algae, at the expense of other forms of life such as fish and molluscs. This is known as the eutrophic state. Nitrogen levels are expected to increase significantly over the next decades due to growing agricultural use of N-based fertilizers in the developing

world. Integrating isotope techniques with conventional aquatic assessment approaches results in more effective management practices that preserve water quality and facilitate remediation efforts of lakes and rivers in the eutrophic state.

The IAEA is advancing technology through Coordinated Research Projects (CRP) such as "Isotopes to Study Nitrogen Pollution and Eutrophication of Rivers and Lakes" to improve capability and expertise in Member States in the use of isotopes to better assess nitrogen pollution on water resources variability, availability and sustainability. Participating countries include Argentina, Belgium, Canada, Chile, China, Cuba, Finland, Ghana, Greece, India, Italy, Kenya, Malaysia, Morocco, Sri Lanka, the United Kingdom, the United States and Viet Nam.

This CRP also promotes new methodologies that will facilitate access to low-cost use of N-isotope data. The promotion of routine use of new analysis technologies on N isotopes will lead to a greater confidence in assessments of pollution of water resources and the adoption of sound remediation strategies for Member States seeking to achieve SDG 6.3, the waste management target: 'By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally'.

## TAKING A CLOSER LOOK AT VITRIFICATION: HOW THE IAEA HELPS COUNTRIES UTILISE ADVANCED IMMOBILISATION TECHNOLOGIES

探入探討玻璃固化：國際原子能總署如何幫助他國使用先進的自動化技術



Radioactive waste disposal poses an ongoing challenge for Member States using nuclear technologies. However, several options are available to immobilise waste resulting from nuclear fuel reprocessing. One of these is vitrification - a mature technology which has been used for high-level nuclear waste immobilization for over 50 years. The IAEA supports Member States that embark on vitrification by providing best practices, expertise and solutions drawn from the Agency's accumulated experience.

Argentina is considering vitrification as a viable option for dealing with its high-level nuclear waste. The Argentine National Programme for Radioactive Waste Management aims to build capacities to implement vitrification processes for radioactive waste with the support of the IAEA's technical cooperation programme[1]. As part of this initiative, an IAEA training course on 'Implementation of Nuclear Wastes Vitrification Technologies' has been held from 20 to 24

February 2017 at the Centro Atómico Bariloche in San Carlos de Bariloche.

The training was provided by both international and local experts, including Michael Ojovan from the IAEA, Ian Pegg from the Catholic University of America (US), Russel Hand from the University of Sheffield (UK) and Nicholas Gribble from the Nuclear National Laboratory (UK). Expertise was also provided by local experts Miguel Oscar Prado, Diego Russo, Arturo Bevilacqua, Diana Lago and others.

Over the five day training course, the participants discussed both international experience and local approaches in utilising the most advanced thermal techniques to safely immobilise radioactive waste and ensure its future safe disposal.

The National Atomic Energy Commission's (CNEA) Nuclear Materials Department at Centro Atomico Bariloche is making good progress in investigating the latest technologies in radioactive waste immobilization. A series of activities, including training for fellows and young scientists and the conduct of scientific visits, together with technological activities including experiments in glass formulation, will be conducted in cooperation with the IAEA and national universities. Centro Atomico Bariloche will also continue extensive sets of self-funded process tests.

## NUCLEAR SAFETY: OFFICIALS CONVENE TO PROMOTE GLOBAL GOOD PRACTICES

促進核能安全：國際原子能總署召開全球性會議



More than 900 representatives including officials from most of the world's nuclear power plant countries will convene at IAEA headquarters in Vienna next week to peer review one another's work in enhancing nuclear safety.

Coming together for the Seventh Review Meeting of the Contracting Parties to the Convention on Nuclear Safety (CNS) from 27 March - 7 April, delegates from the Convention's 80 Contracting Parties will spend two weeks exchanging information on their implementation of the CNS obligations, identifying challenges and offering suggestions to one another for improving nuclear safety.

"This peer review process is a valuable way of promoting global good practices, and identifying challenges, trends and issues to help prevent accidents with radiological consequences, or mitigate these should they occur," said Juan Carlos Lentijo, IAEA Deputy Director General and Head of the Department of Nuclear Safety and Security. "Sharing experiences in this way

enables a collective learning from one another, which improves transparency around nuclear safety. This in turn encourages a culture of continuous improvement in the safety of civil nuclear programmes, which helps establish a high level of nuclear safety worldwide."

The CNS sets international benchmarks in the areas of nuclear installation siting, design, construction and operation, as well as financial and human resources, safety assessment and verification, quality assurance and emergency preparedness. Twenty-nine of the Contracting Parties are operating 448 nuclear power reactors around the world, according to the IAEA's PRIS database.

The Contracting Parties hold Review Meetings every three years, with the last Review Meeting held in 2014.

In 2015, the Contracting Parties held a Diplomatic Conference at which they unanimously adopted the Vienna Declaration on Nuclear Safety. The Declaration contains principles to guide Parties in the implementation of the CNS objectives. Therefore, the Seventh Review Meeting will also be the first opportunity for Contracting Parties to reflect together on the actions they have taken in response to the Declaration's principles.

The CNS entered into force on 24 October 1996. It aims to promote nuclear safety, safety culture,

safety management and knowledge sharing among its parties. It requires Contracting Parties to report on their implementation of the Convention's obligations, and subject these reports to peer review by the Contracting Parties.

The CNS does not compel Contracting Parties to adhere to certain safety standards; rather it acts

as an incentive instrument to guide states in their common interest of achieving a high level of nuclear safety by setting international benchmarks to which they would subscribe.

Almost all countries with operating nuclear power plants are Contracting Parties to the CNS.

## NEA MONTHLY NEWS BULLETIN - APRIL 2017

核能署每月新聞稿 - 2017 年 4 月

### REGULATORY OVERSIGHT OF ORGANISATIONAL CAPABILITY

監督與監管的組織能力



On 20-22 March 2017, the NEA held a workshop on Regulatory Oversight of New Licensee Organisational Capability in Chester, United Kingdom, jointly organised by the NEA Working Group on the Regulation of New Reactors (WGRNR) and the NEA Working Group on Human and Organisational Factors (WGHO), in collaboration with the UK's Office for Nuclear Regulation (ONR). The workshop attracted more

than 40 participants from 15 countries, representing a wide range of experts in licensing of new build reactors and in human and organisational factors. It addressed cross-cutting issues that arise when a prospective nuclear licensee develops its organisational capability and a regulatory body prepares itself for and delivers the regulatory oversight of a prospective licensee's organisational capability. The programme featured three breakout sessions on challenges in developing organisational capability, regulatory challenges with new licensees and oversight of contractors and suppliers by new licensees. The workshop provided an opportunity for the participating experts to share their regulatory approaches and experiences, to exchange views on

resolving the challenges faced by prospective licensees and nuclear regulatory bodies, and to identify commendable practices in regulatory

oversight of new licensee organisational capability.

## BUILDING A SCIENTIFIC COMMUNITY AROUND MATERIAL TEST REACTORS

### 在物料試驗反應器周圍建立一個科學園區



On 22 March 2017, the NEA welcomed experts from the Foundation for Future International Jules Horowitz Experimental Programs (FIJHOP) to discuss preparations for the initial experiments that will take place at the Jules Horowitz Reactor (JHR), and how the NEA can build a framework to facilitate co-operation between material test reactors (MTRs) and the scientific community. The seminar highlighted the unique experimental capacity of the JHR, allowing scientists to address industry relevant

questions involving the behaviour of irradiated fuels and materials under wide-ranging conditions. Connecting this experimental capacity to relevant NEA activities, including the NEA Working Party on Multi-scale Modelling of Fuels and Structural Materials for Nuclear Systems (WPMM), the NEA Expert Group on Accident-tolerant Fuels for LWRs (EGATFL), the NEA Working Group on Fuel Safety (WGFS) and the Nuclear Innovation 2050 (NI2050) Initiative, was determined to be a key component to fulfil FIJHOP's objectives. In follow-up to the seminar, the NEA will organise an international workshop devoted to establishing a systematic qualification process for improving turnaround time between the development of innovative fuels and materials tested at MTRs and their licensing and deployment for commercial applications.