



EU CONTRIBUTIONS TO NON-POWER APPLICATIONS OF NUCLEAR SCIENCE



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*Nuclear and radiological science, technology and applications are used in a wide variety of areas, that go beyond the traditional energy uses, such as **medicine, food and agriculture, environment, industry, materials, space and cultural heritage.***

*The European Union, through the European Commission's (EC) science and knowledge service Joint Research Centre (JRC), **supports the development, safety and sustainability of nuclear science applications (NSA)**, which have an important impact on our societies' development and well-being.*

*The JRC works in close cooperation with EU Member States (MS) and disposes of excellent nuclear infrastructures. The efficient use of these facilities combined with the **expertise of the core research staff** in the JRC enables the array of activities in the different fields of NSA.*



PIONEERING MEDICAL ADVANCES THROUGH NUCLEAR SCIENCE

The JRC has a long-standing programme of research in the health applications of nuclear science, including the **development and knowledge transfer of targeted immunotherapy with alpha radiation (TAT)**. JRC direct support actions on medical applications of nuclear science include:

- **Treatment of advanced prostate cancer:** The radiopharmaceutical Actinium-225-PSMA617 was **first characterized at the JRC in Karlsruhe**, followed by clinical testing in collaboration with hospitals in **Germany and South Africa**.
- **Guidelines and best practices:** For safe implementation of radionuclide therapy in clinical settings.
- **Knowledge sharing:** Knowledge dissemination, provision of training and capacity building in MS and worldwide.
- **Standardisation efforts:** For radionuclide calibrators in hospitals.
- **Open Access:** To the unique JRC nuclear facilities and laboratories, enabling state-of-the-art experimental research, collaboration and capacity building with a European dimension.



JOINING FORCES WITH THE INTERNATIONAL ATOMIC ENERGY AGENCY

A practical arrangement on nuclear science applications has been signed in 2017 **between the JRC and the International Atomic Energy Agency (IAEA)** to complement each institution's work and avoid duplication of efforts in the following fields: **food, agriculture, ocean science, water management, earth observation, health, environmental monitoring and emergency preparedness**. It involves education & training courses, standardization, reference materials, proficiency tests, inter-laboratory comparison exercises and validation of analytical methods.

Close to **40 joint actions were identified at the last review**, including:

- **Medical applications:** Preparation and Clinical Utilization of Radiolabelled Therapeutic Peptides.
- **Radioactivity measurements:** EC has contributed to characterizing reference materials of the IAEA.
- **Nuclear data:** JRC and IAEA Nuclear Data Section cooperate in provision of essential data for the IAEA Member States.
- **Food & agriculture:** Achievements in food authenticity, food fraud and nuclear emergency affecting food and agriculture.



ENSURING A SUSTAINABLE SUPPLY OF MEDICAL RADIOISOTOPES

The need for sustainability of production of the medical radioisotopes poses challenges in the medium to long term, to **ensure a reliable and robust supply from raw material to end-user ready product**. The EC supports this mission through multiple efforts:

- Investigation of **alternative methods of production** of medical radionuclides.
- **Support to market studies & experiments on novel productions:** Ongoing projects supporting market studies on medical radionuclides and experimental investigations on novel productions paths for established (Tc99m) and emerging radionuclides (Ac-225).
- **EU initiatives on the security of supply:** Contribution to the Strategic Agenda of Medical Ionising Radiation Applications (SAMIRA), and the European Observatory on the Supply of Medical Radioisotopes.
- **Surveys on the challenges to the EU supply of medical radioisotopes:** Sustainable Medical Radionuclides: SMER reports.



SUPPORTING INNOVATION ON SAFETY & RADIATION PROTECTION

The EC has launched **two calls for projects** relevant to nuclear science applications, and is working on a research roadmap for medical applications of ionising radiation technologies. The two open calls will foster:

- **Radiation protection and detection of ionising radiation.**
- **Safe use and reliable supply of therapeutic radionuclides.**



CONTRIBUTING TO BEATING CANCER IN EUROPE

- **SAMIRA & EU Beating Cancer Plan:** The EC carries out the implementation of the **Action Plan for the Strategic Agenda for Medical Ionising Radiation Applications (SAMIRA)** that will support the EU Beating Cancer Plan with nuclear contributions.
- **EC Knowledge Centre on Cancer:** Launched in June 2021, the Centre will foster **one EC coordinated approach to tackling cancer** and includes the most important stakeholders, societies, and advocacy groups in Europe. It will support the Europe's Beating Cancer Plan, and the Mission on Cancer.



ADVANCING OTHER NON-POWER APPLICATIONS

- **Measurement of radionuclides:** Implementing measurements of radionuclides in the low-level underground laboratory HADES.
- **Cultural heritage:** Developing nuclear techniques for authentication and preservation.
- **Climate change:** Understanding climate change and its impact through tracer studies.
- **Food:** Developing studies on food authenticity and food fraud detection.
- **Space exploration:** Partnership with the European Space Agency on Am-221 batteries.

