Nuclear medicine against cancer

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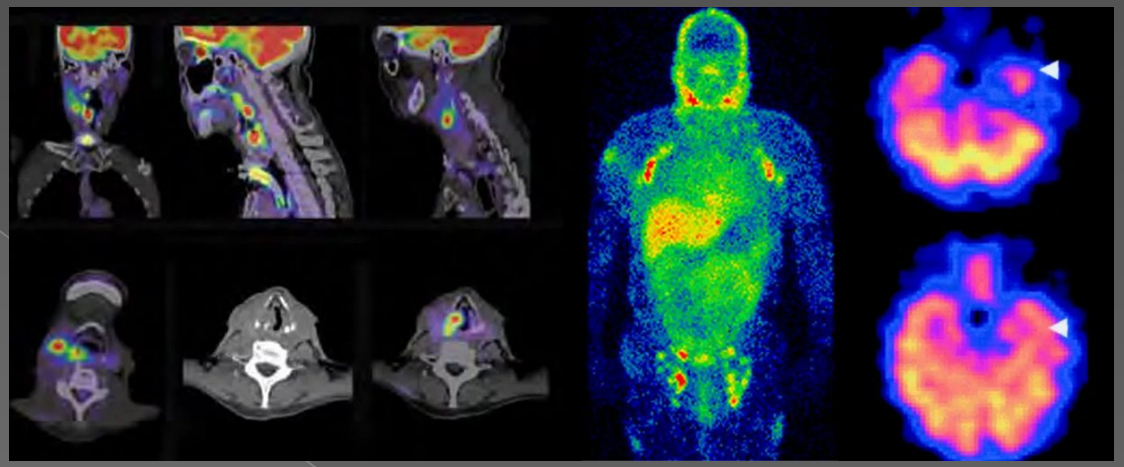
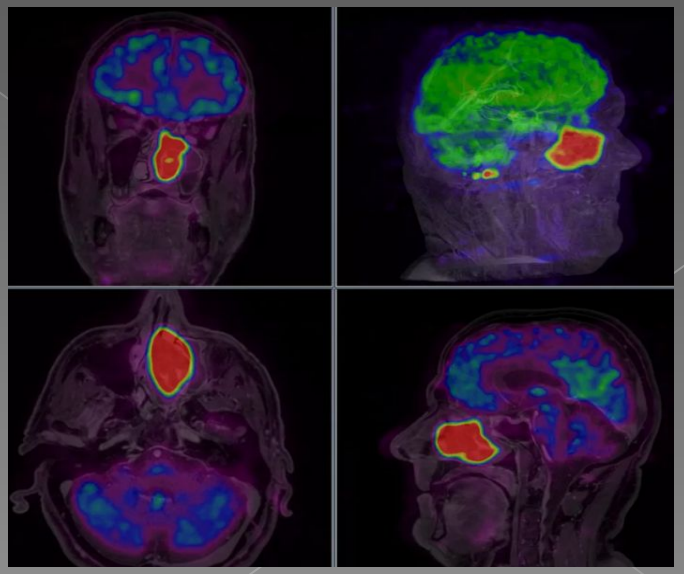
Pediatric faculllty

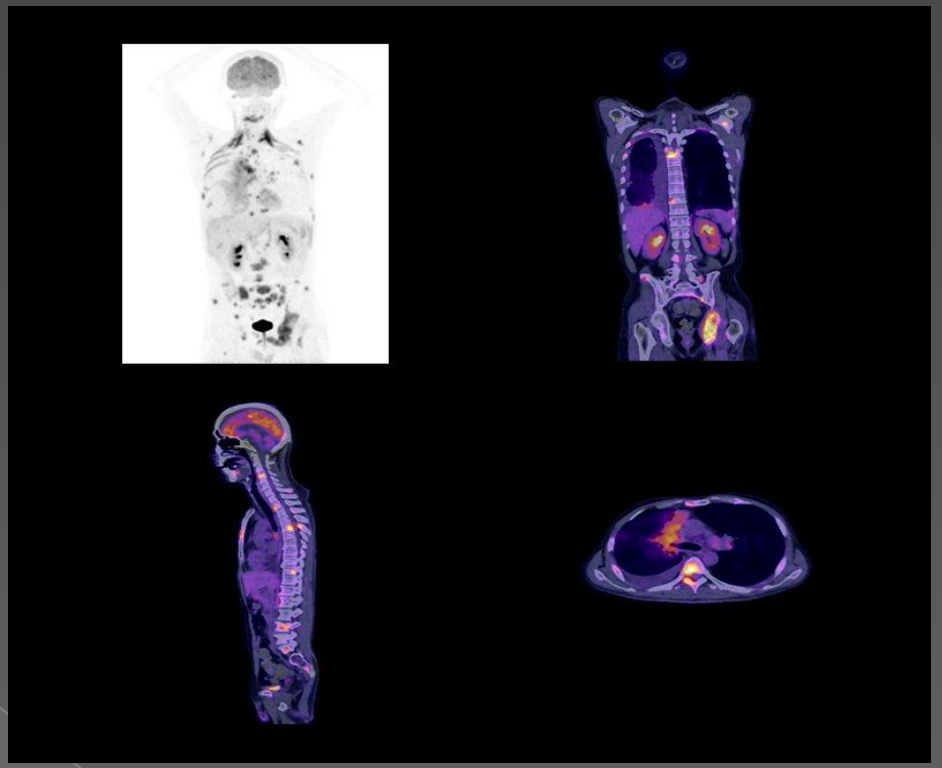
Every year, more than 50 million procedures are performed in the field of nuclear medicine.

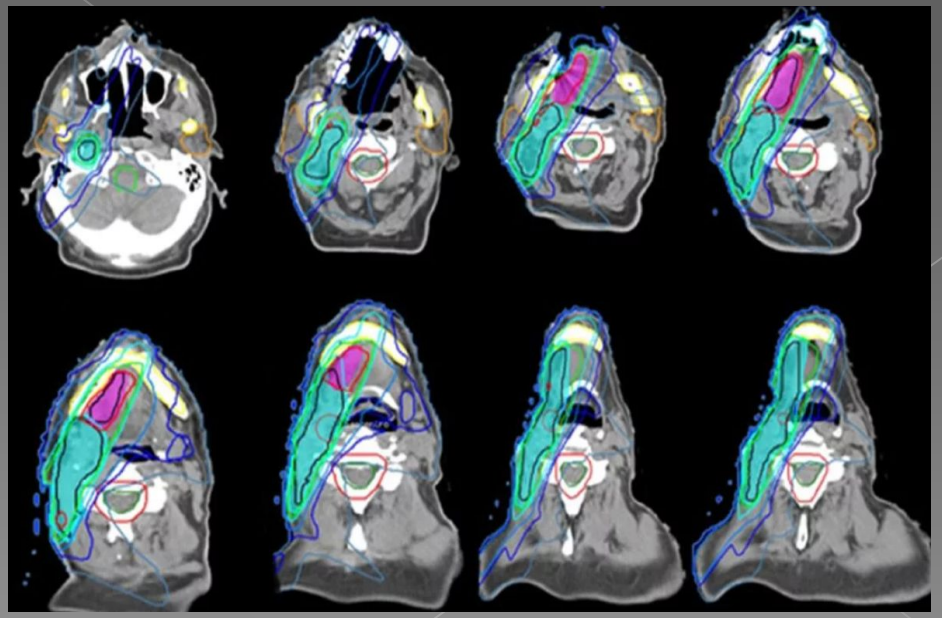
This field combines developments in clinical medicine, molecular biology, pharmacology, nuclear physics, and organic chemistry. The convergence of these disciplines makes it possible to use ionizing radiation in the diagnosis and treatment of cancer, heart diseases, thyroid diseases, and neurological problems.

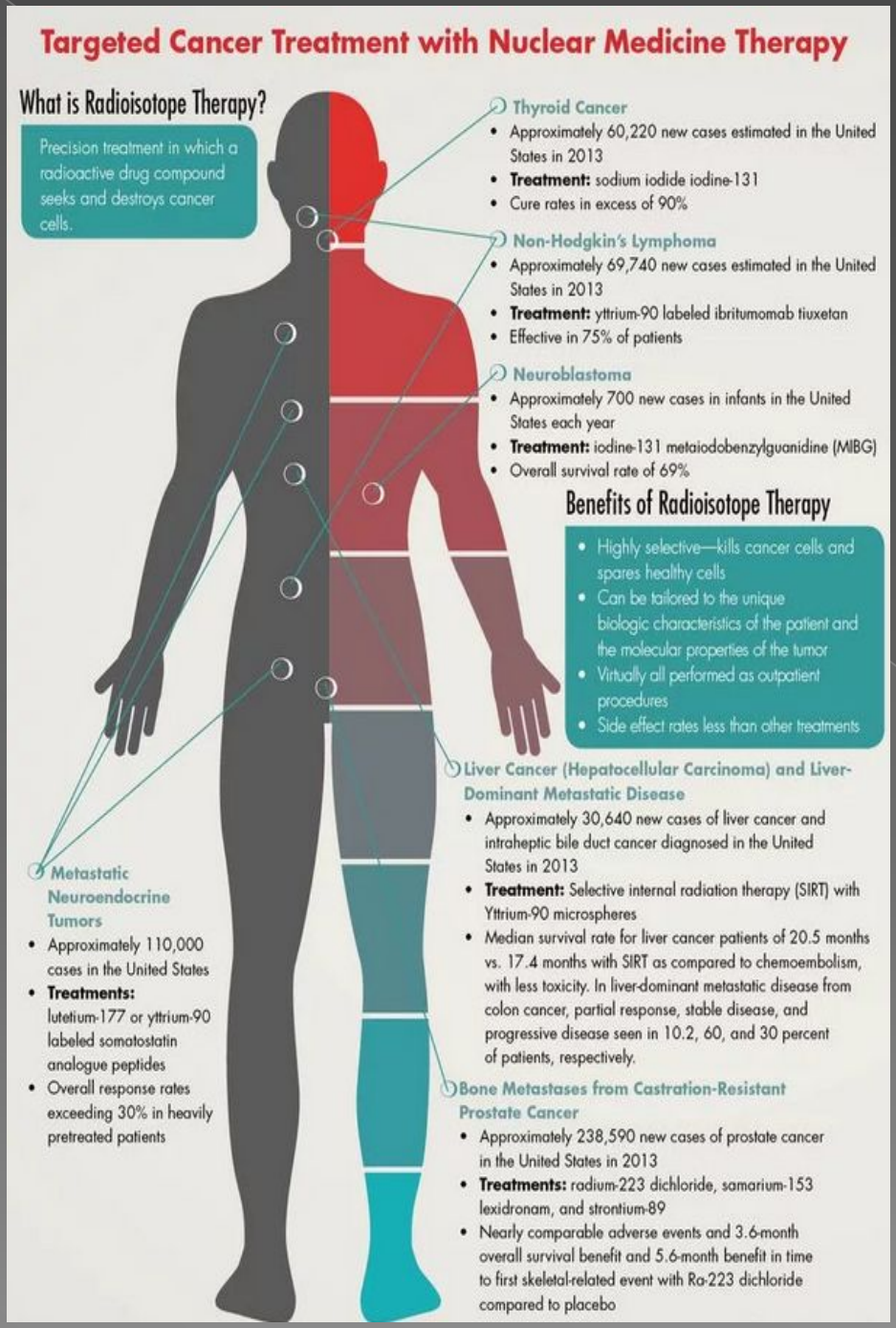




Nuclear medicine has improved the process of diagnosing diseases with new practices and technologies. One of them is positron emission tomography. The patient is administered a radiopharmaceutical special, which includes radioisotopes that emit the antiparticle of the electron. The most common of them is similar in structure to ordinary glucose and is harmless to human. Then the body is scanned and an image is obtained. On it, the tumor cells are highlighted with bright spots, as they absorb more of the drug. The procedure allows us to draw conclusions about the size of the tumor and the stage of the disease, localization and speed of spread of foci. Therefore, the process of developing individual treatment is accelerated.



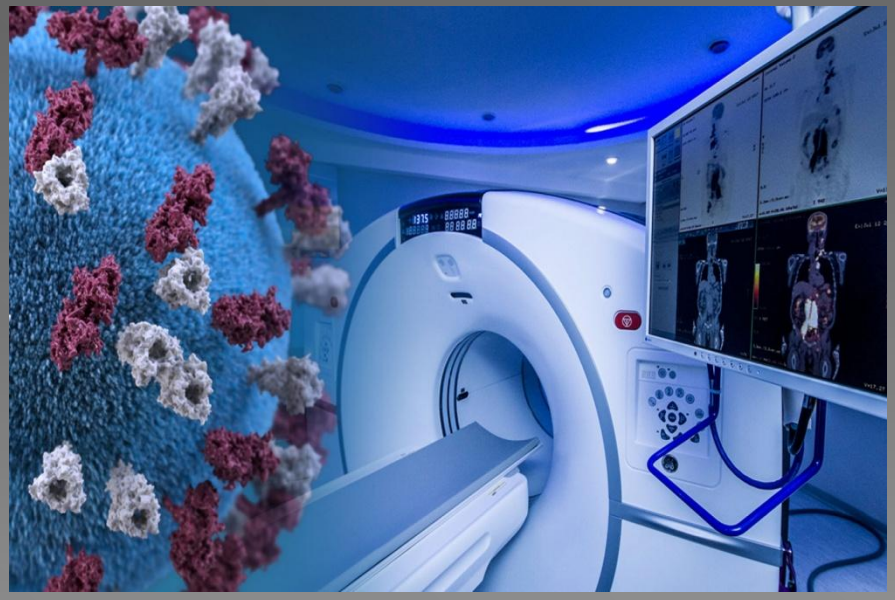


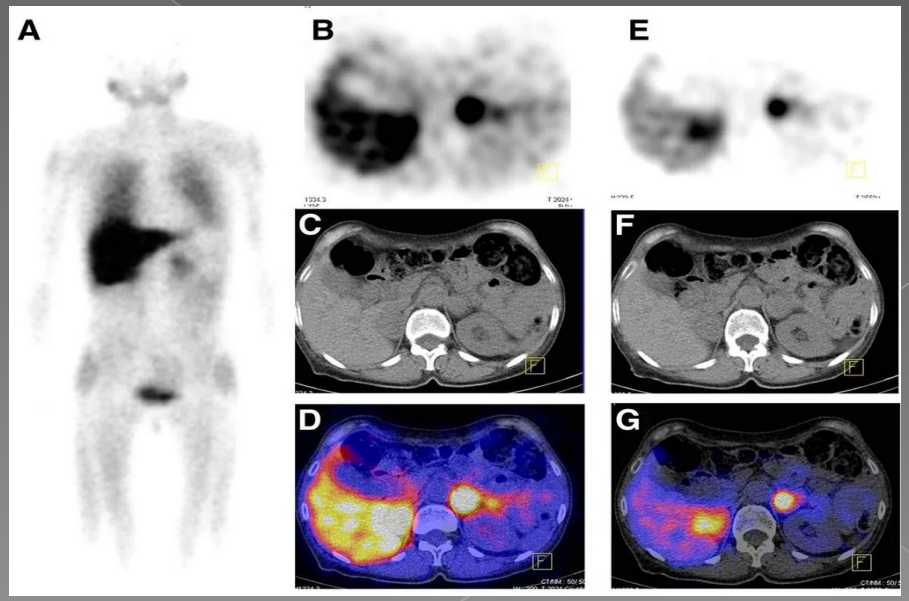


Nuclear technologies are also used to treat diseases. Doctors use targeted radiation exposure to cancer cells and affected organs, minimizing damage to healthy tissues. This allows you to ease the consequences of the procedure for the body and the General well-being of the patient and simultaneously affect all foci. One of the most effective and safe ways to treat cancer is remote radiation therapy. In this case, the radiation dose is delivered contactless, from a short distance. This is how doctors manage to get to the deepest tumors surrounded by healthy tissues. In contact radiation therapy, the radiation source acts on the affected organ through direct contact with it.

Nuclear technologies are used to produce radiopharmaceuticals that are used in both diagnostics and treatment. In therapy, their task is to deliver a specific dose of radiation directly to the tumor or metastases. Radionuclides produce ionizing radiation that kills cancer cells. Their DNA is damaged, which leads to a reduction in the cancer focus. Special compounds administered to the patient accumulate in the center of cell proliferation, destroying them. For example, targeted radionuclide therapy requires the introduction of radiopharmaceuticals under the skin or its absorption by the patient in order to reach the affected cells through the bloodstream.

Compared to surgical methods of cancer treatment, nuclear medicine is more effective. Its methods allow doctors to get rid of even the smallest metastases and single cells in the human body.





The first radiotherapy Department opened in 1903 at the Morozov Institute. Now it is the Herzen Moscow cancer research Institute. The world's first research x-ray radiology clinic appeared in Petrograd in 1918. Now it is the Russian scientific center of radiology and surgical technologies named after academician A. M. Granov. Its founder, Mikhail Nemenov, was one of the world's first radiologists.

Back in Soviet times, 650 radionuclide diagnostics laboratories were operating in the country, allowing for one and a half million studies per year. Specialists of Soviet scientific and industrial enterprises produced 38 radiopharmaceuticals used for medical and industrial purposes.

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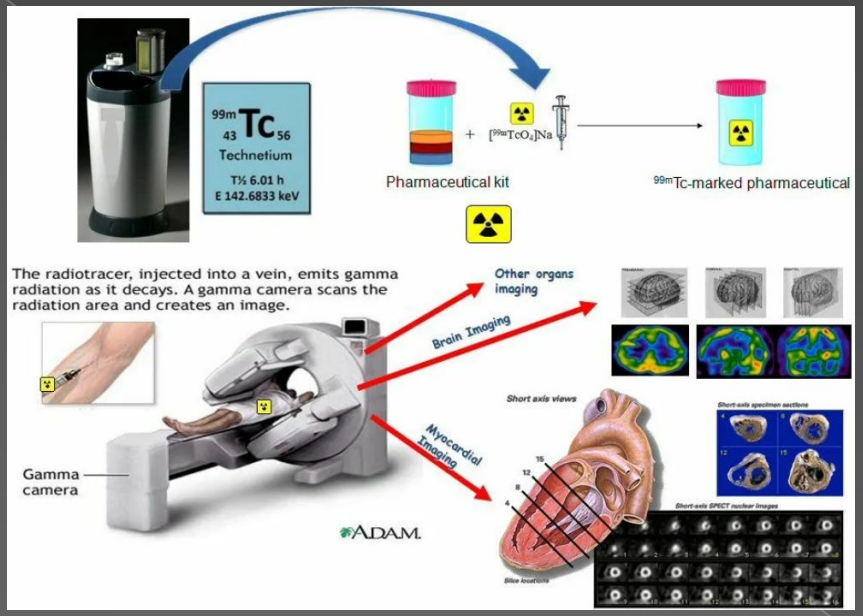
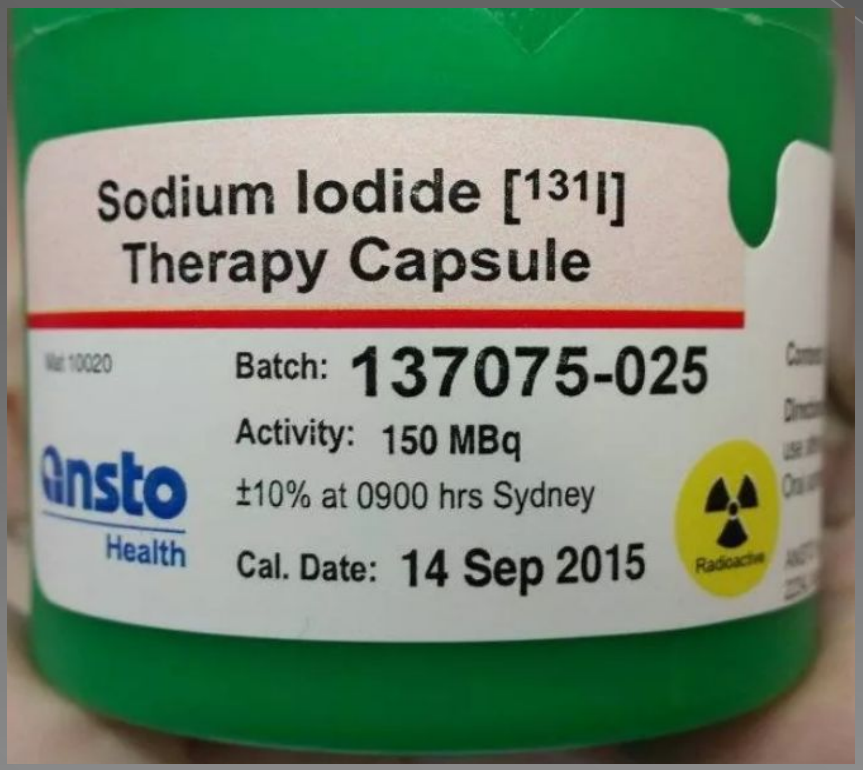
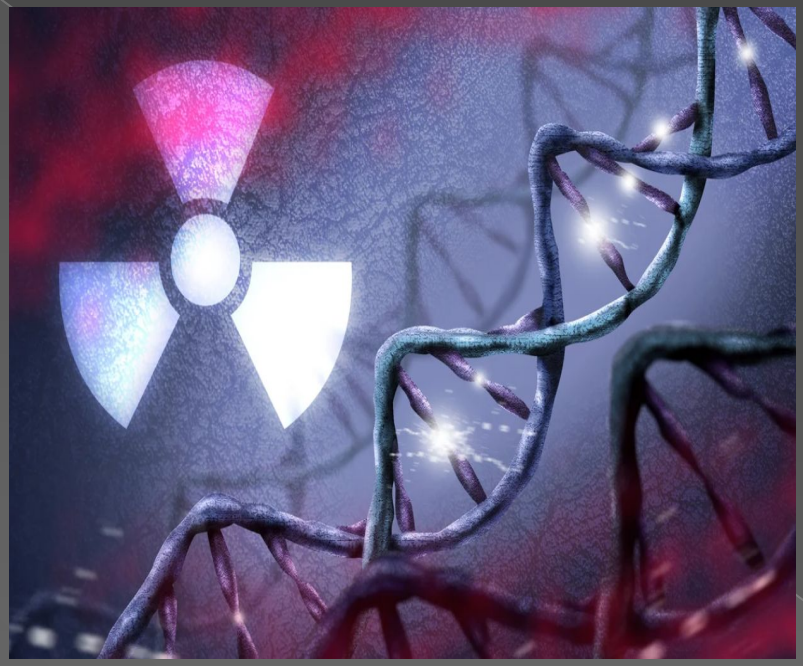
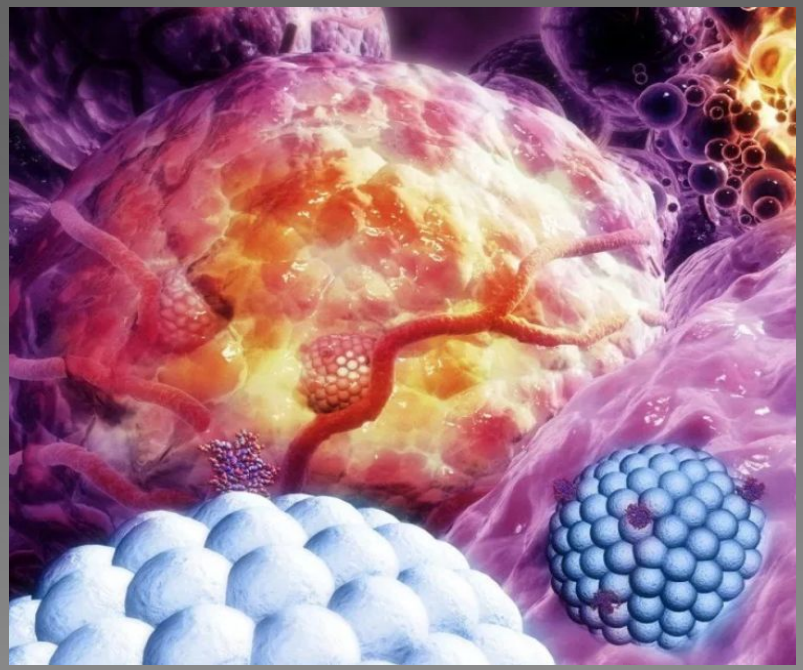




More than 50 million procedures using nuclear medicine methods are performed annually in the world. As a result, the need for radioisotopes as the basis for radiopharmaceuticals and radiation sources in nuclear medicine is growing by 10-15% every year. The number of hospitals and research centers that use radioisotopes to diagnose and treat diseases exceeds 10,000 institutions worldwide. According to Atomenergoprom, the global market for nuclear medicine in 2019 is estimated at $ 13.2 billion. The Russian share in the production of radioisotopes in the world is 25-40%

The most common isotope is technetium-99 m. It is obtained as a result of the decay of the isotope molybdenum-99. Technetium-99 m is used in four out of five cases of radioisotope diagnostics of diseases. This is more than 30 million procedures not only in the field of Oncology, but also in cardiology and neurology. Rosatom provides up to 10% of the world's molybdenum-99 needs. The company also includes two of the world's three centers for the production of a substitute for the isotope iodine-131 - caesium-131. Its advantages are fast action, short terms of rehabilitation of patients, low risks of complications after the procedure.





The unique isotope - californium-252 - is not only the most expensive metal in the world, but also a source of neutrons for radiation therapy of cancer tumors. It is produced in only two research centers in the world, one of which is the research Institute of nuclear reactors in Dimitrovgrad.

THANKS FOR YOUR ATTENTION!