Radiation research provides the scientific basis and the methods to protect man and his environment against ionizing radiation: radiobiological and medical-technological approaches. **Department of Radiation Sciences**, the center combines expertise in radiation protection, on biological medical radiation effects, and on underlying cell-biological and biophysical mechanisms. In addition, the center has competence in research on the behavior of radioactive materials in the environment, in radiation dosimetry and in the further development of radiation applications for diagnostic and therapeutic purposes.

The Department of Radiation Sciences unites the competence at Helmholtz Zentrum München in the fields of radiation biology, radiation risk analysis, radiation and medicine, as well as radiation and medicine. The department cooperates with excellent partners across the globe and carries out a number of advisory functions in national and international bodies.

Radiation research in the Department of Radiation Sciences is characterized by the high degree of coordination and networking, use of cutting-edge technologies and its top-level expertise. Due to its fine-tuned personnel mix to its part of the research at Helmholtz Zentrum München: At the center, researchers investigate the relationship between ionising and non-thermal geno-exposure and the pathogenesis of complex diseases. This is a key basis for the development and evaluation of new strategies, diagnostic methods and preventive strategies. The translation of basic research findings into applications is further enabled by the most modern scientific technical infrastructure and central technology platforms. The center's intensive cooperations with clinical partners contribute to the rapid transfer of scientific insights into medical practice. Furthermore, Helmholtz Zentrum München is devoted to the education and training of the next generation of scientists. Through special courses and information events, the current status of knowledge about radiation protection is passed on to medical doctors, scientists, technicians as well as to members of the police and fire services.

**Radiation Research Seeks to Minimize Risks and Broaden and Improve the Medical Spectrum of Radiation Applications**

**Radiation Research Seeks to Minimize Risks**

- Radiation research provides the scientific basis and the methods to protect man and his environment against ionizing radiation.
- The center combines expertise in radiation protection, on biological medical radiation effects, and on underlying cell-biological and biophysical mechanisms.
- The center has competence in research on the behavior of radioactive materials in the environment, in radiation dosimetry and in the further development of radiation applications for diagnostic and therapeutic purposes.

**Radiation Research and Broaden and Improve the Medical Spectrum of Radiation Applications**

- The main focus of research at the Helmholtz Zentrum München is on major chronic diseases and the interaction of man, genetics and environmental factors. Ionizing Radiation is an environmental factor, but can also play a major role in supportive and personalized medicine.
- The center is committed to improving the quality of radiation protection and is actively working on the implementation of new treatment methods.
- The center's intensive cooperations with clinical partners contribute to the rapid transfer of scientific insights into medical practice.
- The center's research is aimed at achieving a benefit for society.

**Use in Society – Application**

- Determination of exposure, maximum risks, broadening and improving the medical spectrum of ionizing radiation.
- Translational Research, Technology Transfer

**Translational Research, Technology Transfer**

- The Department of Radiation Sciences unites the competence at Helmholtz Zentrum München in the fields of radiation biology, radiation risk analysis, radiation and medicine, as well as radiation and medicine.
- The center cooperates with excellent partners across the globe and carries out a number of advisory functions in national and international bodies.

**Cooperations**

- **Radiation Biology and Radiation Risk**
- **Radiation and the Environment**
- **Medical Applications of Ionizing Radiation**

**Contact persons in the Department of Radiation Sciences**

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**Aim of the DRS: Research to Ensure the Safe Use of Ionizing Radiation**

- **Biological Radiation Effects, Pathogenesis and Risk**
  - Understanding of radiation effects
  - Mathematical models for the extrapolation of radiation biological results to low doses
  - Study of the effect of radiation in biological samples
  - Personalized radiation protection
  - Integration of epidemiology and biology for the risk analysis of low doses

- **Optimized Technology in Medical Radiation Applications**
  - Development of small medical dosimeters
  - Dose reduction on medical imaging: Development of voxel models
  - Radiation therapy: Development of 3D imaging concepts and dose estimation for patients

- **Medical Radiation Biology**
  - Biokinetics and molecular medicine: Mechanisms of radiation carcinogenesis in thyroid and breast cancer: Kaiser
  - Quantum effects on radiation therapy: Development of voxel models
  - Cardiovascular effects
  - Radiation-associated models of carcinogenesis
  - Simulation of the radiation effects
  - Analysis of the biological effect of ionizing radiation

- **Radiolabeled molecules**
  - Determination of radiation exposure from intakes of radio nuclides in food chains to and in humans
  - Radiation and Risk: Mechanism of Action of Low Doses

- **Radioecology and Radiation Exposure of the Population**
  - Thorium in buildings
  - Active detector systems for neutrons, photons and radon
  - Monitoring of radionuclides in the environment
  - Radiation and Risk: Mechanism of Action of Low Doses

**Research Unit of Medical Radiation Physics and Diagnostics (AMSD)**
- **Radiation biophysics**: PD Dr. Stefan Thalhammer
- **Radiation risk**: Dr. Markus Eidemüller
- **Radioecological modeling and retrospective dosimetry**: Dr. Jan Christian
- **Individual dosimetry**: Prof. Dr. Werner Rühm
- **Direction**: Dr. Peter Jacob (acting)

**Institute of Radiation Biology (ISB)**
- **Mechanisms of radiation carcinogenesis in thyroid and breast cancer**: Kaiser
- **Quantum effects on radiation therapy**: Development of voxel models

**Research Unit of Radiation Dosimetry (SSS)**
- **Dose reduction on medical imaging**: Development of voxel models

**Institute of Radiation Protection (SIRION)**
- **Drone radiation physics**: PD. Dr. Jochen Tschiersch

**Research Group of Medical Radiation Physics and Diagnostics (AMSD)**
- **Thoron in buildings**: Coordination: Prof. Dr. Christoph Hoeschen
- **Monitoring of radionuclides in the environment**: Coordination: Prof. Dr. Christoph Hoeschen
- **Radiology and Radiation Exposure of the Population**: Coordination: Prof. Dr. Jochen Tschiersch
- **Medical Radiation Biology**: Coordination: Prof. Dr. Christoph Hoeschen
- **Radiolabeled molecules**: Coordination: Prof. Dr. Werner Rühm