RADIOBIOLOGICAL REPOSITORY OF NUCLEAR WORKERS AS UNIQUE SOURCE FOR STUDY OF RADIATION EFFECTS

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1. Introduction

The Russian Radiobiological Human Tissue Repository (RHTR) has been established and operates for more than 10 years with the financial support of the Federal Medical Biological Agency, Russia and Department of Energy, USA.

RHTR provides investigators from different countries with biospecimens of individuals exposed to prolonged external γ - and/or internal α -radiation in Mayak PA production conditions for study of radiation effects on human health.

The uniqueness of the Mayak PA cogort is in the quality and reliability of the data on exposure history, individual radiation doses, and detailed medical and demographic information available for each nuclear worker.

2. Objectives

- Collect and store of biosamples from Mayak PA workers exposed to radiation and their offspring
- Make available biospecimens from the RHTR for scientists from different countries for studying effects of ionizing radiation in humans

3. Methods

The processing of biosamples for storage is carried out with common techniques.

- Autopsy and surgical/biopsy tissue samples are stored:

- a/ as formalin-fixed

- b/ as paraffin-embedded blocks

- c/ as slides with tissue sections

- Surgical/biopsy tissue samples are stored also under -80°C
- Blood and its components (including DNA) are stored under -80°C

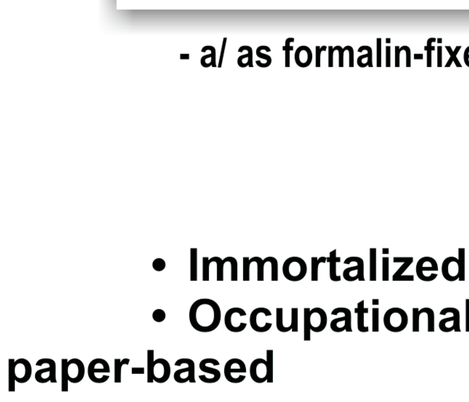
- Immortalized B-lymphocytes are stored under -150°C
- Occupational, dosimetric, medical, etc. information on all registrants is stored in electronic database and as paper-based

4. Results

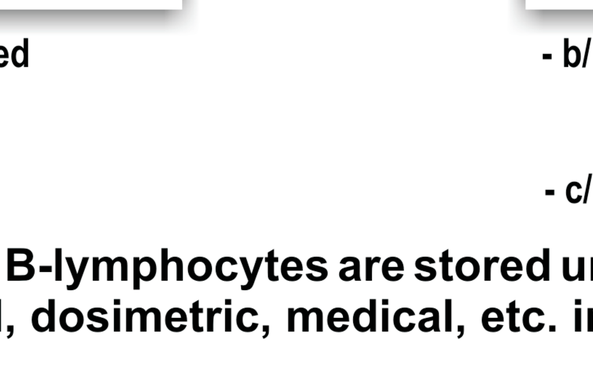
To date the RHTR have over 3 mln biological specimens from workers of the Mayak reactor, radiochemical and plutonium production facilities, auxiliary facilities, and non-occupationally exposed residents of Ozyorsk (total over 8,000 individuals).

The most RHTR registrants have individual external radiation monitoring data available (Fig.1).

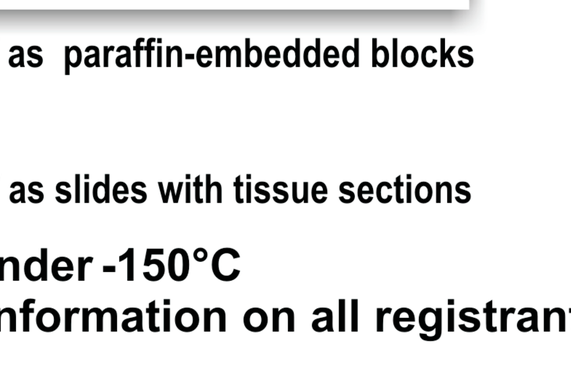
The information on Pu-239 burdens in body and some organs of Mayak PA workers from the main facilities is available too (Fig.2).



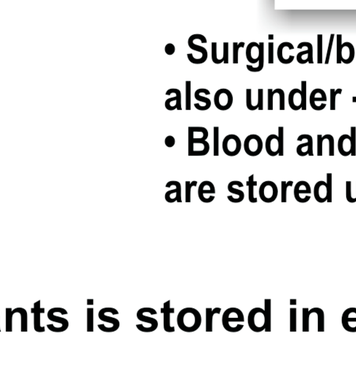
- Diagram of Radiobiological Human Tissue Repository



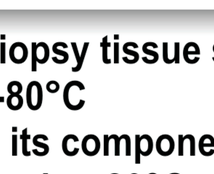
- Accumulative doses of external γ - radiation for RHTR registrants Fig.1



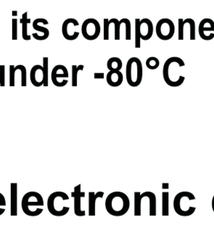
- Pu body burden for registrants with autopsy tissue Fig.2



- PCR products from DNA samples of the RHTR registrants family members Fig.3



- Alveolar macrophage with α-particles. H&E, x200 Fig.4



- Pu in the lung. Storage in formalin over 21 ys, x400 Fig.5

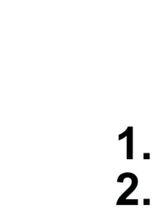
- Adenocarcinoma cells. Colloidal silver, x1000, green color filter Fig.6

The biological material of RHTR has been and continues to be used effectively to resolve different issues in many research projects (Fig.3-6).

List of some Published Works Performed by Scientists from Different Countries using the Repository Biospecimens

1. Romanov S.A.; Hahn F.F.; Guilmette R.A. et al. Medical Radiology and Radiation Safety. 6:58–65; 2001.
2. Guilmette R.A.; Romanov S.A.; Hahn F.F. et al. Radiat. Protect. Dosimetry, 99: 457–461; 2002.
3. Hahn F.F.; Romanov S.A.; Guilmette R.A. et al. Radiat. Protect. Dosimetry. 105:81–84; 2003.
4. Miller S.C., Lloyd R.D., Bruenger F.W. et al. Radiat. Res. 160:517–523, 2003.
5. Hahn F.F.; Romanov S.A.; Guilmette R.A. et al. Radiat. Res. 161:568–581; 2004.
6. Belinsky S.A., Klinge D.M., Liechty K.C. et al. Carcinogenesis. 25(6):1063–1067, 2004.
7. Belosokhov M.V. Abstracts of 16th ERS Annual Congress. – Munich, Germany, 2006.
8. Kirillova E.N., Muksinova K.N., Drugova E.D. et al. Immunology. 28(1):37–42, 2007.
9. Zakharova M.L., Bezlepkin V.G., Kirillova E.N. et al. Medical Radiat. And Radiat. Safety. 55(5):5–13, 2010.
10. Bezlepkin V.G., Kirillova E.N., Zakharova M.L. et al. Radiat. Biol. Radiat. Ecology. 51(1):20–32, 2011.

Investigations, in which biological material of exposed individuals is used, can render invaluable assistance in studying of effects of prolonged external and internal radiation on the basis of actual biology and medicine achievements.



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