FMBC MANAGEMENT OF EMERGENCY MEDICAL RESPONSE IN CASE OF RADIATION ACCIDENTS OR INCIDENTS

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FMBC services

• medical assistance in radiation accidents

• special instrumental investigations in radiation accidents (biophysical, biochemical, medical, etc.)

• specialized radiological team of medical-physicist profile

• analytical support
Emergency Medical Radiation Dosimetry Center [EMRDC]

- In 1999 EMRDC was established by FMBA of Russia as a department of our medical center.
- Since 2000 physical-mathematical methods and applied computing programs for different types of radiation accidents are used to implement forecast and dose assessment in any radiation situations for NPP employees and population.
- We use information and reference systems; database of normative documents in the area of radiation safety, specialized database of exercises and workouts.
- Information system ROCKVILLE allows to make dose assessment for stuff in different radiological emergencies, to keep records of doses, maps of radioactive contamination.
Regional Medical Radiation Dosimetry Centers

In 2010 2 RMRDC were established by FMBA of Russia.

1. Southern Urals RMRDC is located in Ozersk town near “Mayak” facilities affiliated with “ROSATOM” corporation.

2. North-Western RMRDC is located in Sant-Peterburg.
PLACES OF RADIATION ACCIDENTS, FEDERAL AND 2 REGIONAL EMERGENCY MEDICAL DOSIMETRY CENTRES
Radiological Emergency Medical Response System FMBA of Russia is based on:

- Federal and 2 regional radiological emergency medical and radiation dosimetry centers.
- Normative, methodological and administrative documents.
- Mobile radiological emergency teams and groups of expert support (at relevant scientific institutions).
- Specialized software (programs, codes, databases, etc.) and technical tools.
- Drills and exercises (preparedness and training).
- Cooperation with other state institutions ("ROSATOM" corporation, Ministry of Public Health).
### Radiation accidents in the former USSR and Russia up to 01 January 2016 followed by radiation injuries

<table>
<thead>
<tr>
<th>Incident classification</th>
<th>Number of people injured including bone marrow syndrome</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
</tr>
<tr>
<td>Incidents with radioisotope units and their sources (total)</td>
<td>174</td>
</tr>
<tr>
<td>Reactor incidents and the loss of control of critical fissile materials (total without Chernobyl)</td>
<td>82</td>
</tr>
<tr>
<td>X-ray units and accelerators (total)</td>
<td>45</td>
</tr>
<tr>
<td>Atomic submarines</td>
<td>133</td>
</tr>
<tr>
<td>LRI cases at “Mayak” RF</td>
<td>168</td>
</tr>
<tr>
<td>Other incidents (total)</td>
<td>17</td>
</tr>
<tr>
<td>Chernobyl accident</td>
<td>134</td>
</tr>
<tr>
<td>TOTAL</td>
<td>754</td>
</tr>
</tbody>
</table>
• evaluation of medical consequences of radiation accident
• preparedness of medical institutions to respond to radiation accident
• radiation safety during contaminative patients transportation
• training for medical staff & drilling practical skills
Clinical Department of Radiation Medicine at Burnazyan FMBC (since 1951)

- Diagnosis and treatment for ARS and LRI
- Confirmation of overexposure and dose estimation with cytogenetic investigation of chromosomal aberrations (Classic and FISH-method)
- Development of practical usage of radioprotective pharmaceuticals and early therapy medicines for ARS
- Differential diagnosis for radiation and non-radiation occupational damages
Radiological Emergency Medical Experience

For 60 years
• more than 200 radiological events
• 1500 people were overexposed to ionizing radiation
• among them 350 ARS (including 134 patients after the Chernobyl Accident)

For 10 years
• 64 medical specialists from different countries have got studying courses on medical emergency response in radiation accidents

36 wards for patients with ARS
5 wards with aseptic regime
5 wards for isolation contaminated persons
Facilities for external decontamination of patients with different damages
Special means for skin decontamination
NOTIFICATION ON RADIATION ACCIDENT

“Rosenergoatom” concern

FMBA of Russia

“Rosatom” corporation

Russian Ministry for Emergency Situations

On-duty specialist EMRDC

Relevant experts

Mobile radiological emergency team
Expert Group Responsibility

- Radiation Hygiene
- Radiation Protection
- Computer modeling and forecasting for spreading radioactive release in the environment
- External exposure dosimetry
- Internal exposure dosimetry
- Diagnosis and forecast for deterministic effects (ARS, LRI)
Areas of Expertise

- Nuclear and radiation safety (radiation protection, radioecology)
- Evaluation and assessment doses of ionizing radiation (modeling & forecast of exposure, external & internal doses, assessment of radiation impact to environment and human health)
- Estimation techniques (Alfa-, Beta-, Gamma-radiation, environmental control, spectrometry of radionuclides in human body & bioassays)
- Medical service (management of ARS, LRI, treatment for contaminated wounds, decporation therapy after radioactive intake)
TIME TO EMESIS POST-ACCIDENT

Graph showing the relationship between dose (Gy) and time to emesis (hours). The graph includes a trend line and scattered data points.
Vomiting for ARS diagnosis

<table>
<thead>
<tr>
<th>Accident</th>
<th>Se, %</th>
<th>Sp, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chernobyl</td>
<td>95</td>
<td>90</td>
</tr>
<tr>
<td>Others</td>
<td>97</td>
<td>82</td>
</tr>
</tbody>
</table>
Blood lymphocyte count and prediction of ARS severity

- **Normal Range**
- **Moderate**
- **Severe**
- **Very Severe**
- **Lethal**

**Patient Absolute Lymphocytes**

- 0
- 500
- 1,000
- 1,500
- 2,000
- 2,500
- 3,000

**Hours**

- 0
- 3
- 6
- 17
- 24
- 48

**INJURY**
Medical triage
Emergency medical service for exposed patients
Radiation protection for medical staff and patients
Radiation survey, blood cell count, dose assessment
Decontamination & decorporation procedures

Readiness to start activity after notification:
at working time is up to 3 hours
at off time is up to 6 hours
MEDICAL EQUIPMENT

- Shock therapy suit
- Intensive medical care unit
- Special medicines for overexposed persons
PORTABLE EQUIPMENT for HEALTH PHYSICIST

Дозиметр - радиометр МКС

Дозиметр - радиометр ДКС

Дозиметр - радиометр МКС РМ 1402 М

Дозиметр - радиометр ДКС ДКС-АТ 1121 ДКС-АТ 1123
Spectrometry equipment for WBC
Radiation monitoring of territories
Marking contaminated territories on map
Estimation of radioactive sources
Identification of radionuclides in the contaminated area
Taking samples of soil, water, air for radiological estimations
Sending geography coordinates of the sample taking places with results of estimations in real-time
Fukushima accident

- On April 8, 2011 our team fulfilled radiation survey of 268 residents of Tokyo City, citizens of RF

- 3 from examined persons had about 100 Bq of I-131 in their thyroids
Training exercises for medical stuff held twice a year
IAEA request on medical support

• Last Friday we received a request on hospitalization and treatment a patient who was accidently overexposed at Lilo, Georgia in 1997.
• At this meeting the Colleague from France has already mentioned in his report this patient who was treated at Hospital Percy in 1997 for a while of about 6 months.
• Now there is no emergency situation with the patient. He needs for a few surgical operations on his hip and post-operation rehabilitation for about a few months.
• Russia has already taken part in the Lilo case. The most severe injured patient from 3 exposed persons was treated for about 2 years in our hospital for deep radiation damage of tissues and organs in the chest.
• Unfortunately he died in about 2 years after accidental exposure.
• Decision making on the new IAEA request is in progress now at FMBA of Russia.