Response to Fukushima NPP Accident
- Medical Response in Korea -

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Korea Institute of Radiological & Medical Sciences (KIRAMS)

SEOUL, KOREA
- South Korea is the geographically closest country to Japan.
- Wind is the prevailing westerlies (偏西風).
Contents

◆ National plan for radiation emergency preparedness in Korea
◆ Introduction of medical preparedness system in Korea
◆ Medical response to Fukushima NPP accident in Korea
Nuclear Reactors & RI industry in Korea

- Nuclear Reactors in Operation (23)
- Nuclear Reactors under Construction (9)
- Nuclear Reactors under Consideration (8)

- Nuclear power plants are providing 38% of the national power supply

RI -- Concentrated in Metropolitan Areas

- Seoul: 46% (1,982)
- Wolseong: 17% (748)
Radiation Emergency Medical Network in Korea

NARMED-Net (National Radiation Emergency Medical Network)

- KIRAMS
- 10 primary medical centers near NPP
- 12 secondary centers over Korea
### Emergency Levels in NPP

<table>
<thead>
<tr>
<th>White Emergency</th>
<th>Radiation effects limited inside the building where the accident takes place.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue Emergency</td>
<td>Radiation effects limited inside the plant area.</td>
</tr>
<tr>
<td>Red Emergency</td>
<td>Radiation effects reach beyond the plant area.</td>
</tr>
</tbody>
</table>

Every exercise is performed on red emergency basis.
Organization of Medical Support

HQ for Medical Support
NREMC/KIRAMS

HQ for Medical Support
Briefing room

Competent Authorities

On-site contingent for medical support
Primary/Secondary local medical centers
On-site medical support team
- Dispatched from KIRAMS (Emergency response A team)

HQ for expanded floor medical support
- Floor medical support team (Emergency response B, C team)
- Technical support team
- Administrative support team

Hospital-based medical support
KIRAMS
- Primary/Secondary local medical centers
- Technical advisory committee

+82-2-970-2300 (24 hour Emergency Call Services)
On-site Medical Response Flow

Field Triage

- Life threatening injury
- Not seriously injured or uninjured

Transfer to the Nearest Emergency Medical Center

Joint Emergency Medical Center

Contamination Survey

- Non-contaminated
- Contaminated

On-site General Emergency Clinic
On-site Radiation Emergency Clinic

Registration Area

Local Government

Emergency Shelter (School or Convention Center)

KIRAMS

Transfer to the Designated Emergency Medical Centers

Non-contaminated Uninjured
Contaminated Injured
Organization

2003. 5 “Act on physical protection of nuclear facilities and countermeasure for radiation emergency” enacted
※ Constructed the national radiation emergency medical system including NREMC and 18 local centers (2004) → 22 local centers (2013)

Primary centers (10)
- Local hospitals near NPP (7)
- Military hospitals (3)

Secondary centers (12)
- Major Univ. Hospitals (10)
- Major Military Hospitals (2)
NREMC is efficiently supported by KCCHc

- **KIRAMS**
  - Korea Institute of Radiological and Medical Sciences

- **Research Center (RIRAMS)**
  - radiation biology
  - cancer biology
  - development of radiopharmaceuticals

- **National Radiation Emergency Medical Center (NREMC)**
  - established in 2002
  - HQ of nation-wide network for radiation medical countermeasure
  - radiation effect clinic
  - isolation ward for contamination

- **Korea Cancer Center Hospital (KCCH)**
  - leading cancer center since 1963
  - 18 specialized ca. depts.
  - education & training
  - clinical & translational research
KCCH (hospital)

NREMC

Research center

- radiation biology
- radiation beam
- animal experiments
- health physicists

• Know-how from oncologists
  (ARS is similar to side effect of radiotherapy or chemotherapy)
• Hospital facilities and personal resources

KIRAMS Synergy
NREMC
National radiation emergency medical center

Division of Radiation Emergency Care
- Medical service team
- Health physics team
- Biodosimetry team

Division of Planning & Research
- Administration & planning team
- Emergency preparedness response & education team
- ARS therapeutic research team
- Low-dose radiation research team

global affairs team

liaison institute of WHO (since 2004)
Major Functions of NREMC

- Medical management
- Education & Training
- National Network
- Dosimetry
- R&D
- International Cooperation
Characteristics of Korean System
- Radiation Emergency Medical Network -

- Designated in national law
  - national network system, role of KIRAMS/NREMC
- Financial support by central government
- Centralized system of national network
  - even distribution of resources
  - even opportunities for education & training
  - easy to quality control
  - possible to distant support by other sites
  - balances for national/military/private institutes

- NREMC as a part of radiation-oriented specialized institute
  - synergy with cancer hospital and radiation research center
Limitations of Korean System
- Radiation Emergency Medical Network -

- Belated start compared to nuclear industry
- Limited budget for medical preparedness
- Need to further cooperate with Ministry of Health
- Need to facilitate with local government
Medical Response to Fukushima NPP accident in Korea
Activities after the Fukushima accident

“Real situation of activating the medical countermeasure network”

① Screening for contaminated persons
② Dosimetry - biological & physical
③ Communication with the public and medical personnel
Activating medical network

- Activating the HQ for medical support (KIRAMS) ‘Mar 12 ~ May 3, 2011
- Cooperation with the network hospitals
  - providing guidelines for medical staffs in the network
  - suggesting each roles to 21 primary and secondary medical center
  - on-site dispatch for contamination screening
Screening for contamination

Population Monitoring by Portal Monitor *(March 17 ~ June 7, 2011)*
- at 4 airports *(by KINS, KIRAMS and 2 affiliated centers)*
- at 4 harbors *(by KAERI, Daegu military hosp.)*
  - To check arrivals from Japan
  - More than 330,000 people screened
    → only 2 persons were detected on cloths (>1uSv/hr)

Contamination Check-up at Medical Centers
- To check radioactive contamination for the public
- No one contaminated with radioactive material until now
• Activating OPD radiation-clinic in NREMC and designated medical centers

• Consultation for the public (NREMC) : providing medical information
  - 24 hour direct phone call services for consultation : 1,523
  - Q&A, FAQ services (NREMC home page, on line portal web sites) : 505

• Providing information on radiation health effect from Fukushima accident
  via mass media (TV, radio, newspaper, journals, etc) : 241

• Consensus meeting for medical doctors with different voices
  (May~July, 2011) -- publishing a consensus document

• Lectures for medical personnel and the public : 25
## Inquiries of NREMC homepage consultation board

### <2011. Mar 12~Oct 22>

<table>
<thead>
<tr>
<th>Category of contents</th>
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<tbody>
<tr>
<td>external contamination inspection</td>
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<td>safety of residence in Japan</td>
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<td>influx of radioactive materials into Korea</td>
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<td>safety for contacting emigrants from Japan and Japanese goods</td>
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<td>health effect of radiation in child, adolescent and pregnant woman</td>
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<td>relation between radiation exposure and questioner’s symptoms</td>
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<td>urgent requests for news gathering and reference materials</td>
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Inquiries of NREMC 24hr phone call consultation

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<td>safety of residence in Japan</td>
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<td>requests from journalists or broadcasting system</td>
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<td>antidote to radiation exposure</td>
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<td>2.0</td>
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1,523
## Contents of response for mass media

*<2011. Mar 12~Oct 22>*

<table>
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<th>Category of contents</th>
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</thead>
<tbody>
<tr>
<td>Questions for Influx of radioactive materials into Korea and its health effect</td>
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<td>Explanations to control unreasonable rumors</td>
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<td>Information for antidote to radiation exposure</td>
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<td>Therapy for ARS and internally contaminated persons</td>
<td>11</td>
<td>4.6</td>
</tr>
<tr>
<td>Inspection for radiation contamination</td>
<td>8</td>
<td>3.3</td>
</tr>
<tr>
<td>Food safety</td>
<td>3</td>
<td>1.2</td>
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</table>
Radiation Emergency Clinic: Flowchart

- Screening contamination survey
  - Non-contamination
    - 2nd contamination survey
      - Contamination
        - Wet decontamination
      - 3rd contamination survey
        - Contamination
          - Whole body monitoring for internal contamination
            - <1mSv
              - Assessed committed effective dose
                - 1~200 mSv
                  - Medical counsel
                - >200 mSv
                  - Administration
                    - Isolation
              - Medical counsel
            - No hopelessness
              - Go home
            - Hopelessness
              - Complete blood count, whole body monitoring, biodosimetry
  - Non
    - Dry decontamination
Radiation Emergency Clinic: inspection items

**External contamination check**
- (γ)
- (α, β, γ)

**Internal contamination check**
- In vivo bioassay
- In vitro bioassay

**CBC**

**Biodosimetry**
Medical check-up for the Japan travelers
- mostly emergency rescuers & journalists, or students
- more than 700 people visited NREMC

Estimate radiation exposure and risk based on visitors’ movement line in Japan and estimates from SPEEDI.

Medical counseling with specific history (no ARS)
- Screening external contamination (0/748)
- CBC (317 tested – all WNL)
- Dicentric chromosome analysis: on demand, 265 tested
- Whole body counter: 184 tested
- Urine test (in-vitro bioassay): 57 tested

No symptomatic person (!!!except psychological problems…anxiety)
No internal and external contaminated persons
Cytogenetic Biodosimetry for Fukushima Travelers


- Subjects: 265 Fukushima travelers vs. 37 non-travelers
  - 226 journalists, 22 rescue workers, and 17 others
  - male(238), female(27)
  - mean age of 38.7 yrs (22~68 yrs.)

- Results
  - background DIC: 234/265 (88.3%)
  - increased DIC: 31/265 (11.7%)

[Most have history of medical exposure (CT, PET)]
Changes of medical activities after Fukushima accident

- Fukushima NPP accident
- Detection of RI in Korea
- Biodosimetry result
- Cesium map
- Japan MEST
- Mass media response
- NREMC web site consultation
- Phone call consultation
- NREMC clinic visitors
- Local REMC clinic visitors
- Biodosimetry (Dicentric chromosome)
- Internal contamination (WBC)

Changes of medical activities after the Fukushima NPP accident.
There are no evidences to be exposed to radiation from Fukushima NPP accident among Koreans.

Psychological problem of the public!

Social problems remained!
We need

- Efforts to provide the information for radiation health effect to the public and journalists
- Cooperation with Ministry of Health:
  - collaboration with emergency medicine network
  - education program for general medical doctors
- Planning for remote medical support from other sites
- To activate the local government for radiation accident & to reconsider evacuation plan
Thank you for your attention!