Some Lessons on Radiological Protection Learned from the Accident of the Fukushima Daiichi Nuclear Power Plant

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Science and Value

- **ICRP recommends**
  - Use of the LNT model for cancer risk
  - The level of protection should be the best possible under the prevailing circumstances

- **Whether the philosophy of ICRP functions may depend upon how to answer two questions**
  - How high is cancer risk below a few ten mSv ?
  - Why are the reference levels different among exposure situation ?

    Premised on: Low-dose risk would be not higher than other risks.

Radiation risk in low doses

- **The meaning of the LNT model**

  The LNT model is not universally accepted as biological truth, but rather, because we do not actually know what level of risk is associated with very-low-dose exposure, it is considered to be a prudent judgment for public policy aimed at avoiding unnecessary risk from exposure. (Pub.103, A178)

- **Risk estimate of ICRP**
  - 0.1 Sv increases about 0.5% excess risk in addition to baseline.
  - Population-average risk can be described

- **Gap of risk perception between the public and ICRP**
  - Risk is a prospective concept for preventing potential effects
  - People want to know what will happen due to exposure
    - Miscalculation of effects using the nominal risk coefficient

Radiation Dose Criteria

- The reference levels are originally used for radiation protection purpose.
  - Food restriction
  - Evacuation

- The reference levels should be explained for risk communication in existing exposure situation
  - Misunderstanding borderlines between safety and danger
  - The meanings of the dose criteria
  - Driving force to reduce the dose

Transition to existing exposure situation

- After March 24, the atmospheric release of I-131 declined
  - Stable contamination in the affected area without decay
  - The transition from emergencies to existing exposure situation gradually in progress

- The Japanese government did not openly give a message regarding radiological measures
  - To understand the meanings of the dose criteria
  - To explain the radiological situation

Issue raised - 1

- The MEXT decided the use of the tentative criteria of 3.8μSv/hr at the schoolyard
  - Based on 20 mSv/y of the dose band
  - Assuming inside dose rate of 1.52 μSv/hr due to shielding

- April 29, a government adviser critisized the criteria
  - Criticism : Unacceptable higher in children
  - Since the dose limit of 1 mSv/y

- The criticism brought :
  - The public further increased mistrust in radiation protection policy
  - Concern about internal exposure

To communicate the meaning of the dose criteria adopted

Issue raised - 2

- Much concern was increasing about internal exposure
  - People requested to measure an internal exposure with WBC
  - WBC did not work for many subjects
- Minami-Souma city independently investigated internal exposure
  - Reported no significant quantity less than 1 mSv
- The risk of internal exposure is higher than external ?
  - The information on the Internet provided that internal exposure is more dangerous
  - Non-radiation experts protested against current risk estimate

Issue raised - 3

- The public fears the risk of internal exposure in metropolitan area
  - Reject school lunch
  - Low contamination at the playgrounds

- July 29, Food Safety Commission proposed
  - Lifetime dose less than 100 mSv shows no evidence of cancer risk
  - Currently, risk management of contaminated food is under discussion to derive food activity restriction (Bq/kg)

Risk communication on radiation risk was needed through dialogue with non-radiation experts

Dialogue with non-radiation experts

- **Non-radiation experts are interested in radiation risk**
  - Radiation experts tend to focus on the dose
  - Their criticism is that radiation lifetime risk following dose criteria such as the dose limits receives no social acceptance.
  - This likely comes from the situation that radiation risk has not been communicated with non-radiation experts

- **The risk-based philosophy of radiological protection has not prevailed even in chemical cancer risk**
  - The science and value about cancer risk should be discussed with non-radiation experts.
  - Risk-informed approach should be required.
  - Balancing with other risks

Conclusions

- **Risk estimate**
  - What low-dose risk means need to be clearly answered
  - Risk assessment for communicating with the public
  - Provide relevant information depending on age and lifestyle.

- **Dialogue about risk-informed approach**
  - Disseminate risk-informed approach to cancer risk management under the prevailing circumstances
  - Dialogue with non-radiation risk experts such as chemicals