

# CONSCIOUSNESS ANALYSIS ON SAFETY CULTURE IMPROVEMENT IN RADIATION FACILITIES IN JAPAN

Hiromi KOIKE<sup>1</sup>, Takahiro KOSHIBA<sup>2</sup>,  
Akira KUDO<sup>3</sup>, Takeshi IIMOTO<sup>1</sup>

1. The University of Tokyo, Tokyo, Japan
2. Tokyo University of Science, Chiba, Japan
3. Chiyoda Technol Corporation, Tokyo, Japan



# Research Purpose

1. To survey the **latest status of consciousness on Radiation Safety Culture (RSC) improvement** in Japanese radiation facilities
2. To discuss effective **countermeasures** for radiation facilities in the Japanese **Education and Research sector (ER sector)**.

|              | Step Purpose  | Questionnaire Respondent                                | Target Facility  |
|--------------|---|---|------------------|
| <b>STEP1</b> | <ul style="list-style-type: none"> <li>• To clarify the <b>keywords</b> which Japanese RSMs image on RSC</li> </ul>   | Radiation Safety Manager ( <b>RSM</b> )<br>N= <b>20</b> | All sectors      |
| <b>STEP2</b> | <ul style="list-style-type: none"> <li>• To clarify the <b>characteristics and issues</b> for RSC improvement of <b>higher ER sector</b> under comparison with the other sectors</li> </ul>                 |   | Higher ER sector |
| <b>STEP3</b> | <ul style="list-style-type: none"> <li>• To clarify <b>effective countermeasures</b> to fostering RSC for Japanese radiation facilities (to compare with those of other countries in the future)</li> </ul> | RSM<br>&<br>Radiation worker<br>N= <b>334</b>           | Higher ER sector |



# Step1. Free-description-type Questionnaire

## ◆ Respondent : RSM (N=20)

Hospital (4), Irradiation Facility (3)

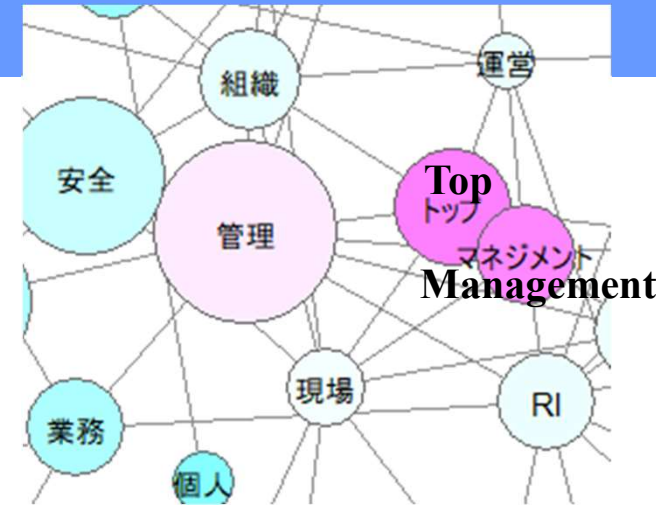
University (4) people, Laboratory (4)

Pharmaceutical Company (5)

## ◆ Text Mining Analysis

### Co-Occurrence Network Analysis

Which words are frequent and important?



## ◆ Contents of Free description type questionnaire

**Question 1 : What is your current situation evaluated from a critical viewpoint?**

**Question 2 : How can we correctly recognize the current situation?**

**Question 3 : What should be done for further progress?**

### Concerning Basic 4 Key Sentences ※ Based on Nuclear Safety White Paper (2006) of Japan

1. An organizational culture has been formed in which the front-line personnel can work with **pride** and **responsibility**
2. It is recognized that the commitment of **top management** of each business is absolutely necessary
3. **Honest and frank "dialogue"** aiming for communication between different organizations or groups such as veteran and young managers, including management and top management, are important
4. In order to prevent the deterioration of safety culture, it is important that the organization and the individuals belonging to the organization hold "**a posture constantly asking questions**"



# Free-description-type questionnaire Step1. Keywords from Nuclear Safety White Paper

| Question 1. current situation        |                   |
|--------------------------------------|-------------------|
| High central words : Top, Management |                   |
| Keyword                              | Centrality Values |
| Top                                  | 1.00              |
| Management                           | 0.98              |

| Question 2. correct recognition          |                   |
|--|-------------------|
| High central words : Education, Training |                   |
| Keyword                                  | Centrality Values |
| Education                                | 1.00              |
| Training                                 | 0.95              |

| Question 3. further progress                |                   |
|---|-------------------|
| High central words : Prevention, Regulation |                   |
| Keyword                                     | Centrality Values |
| Prevention                                  | 1.00              |
| Regulation                                  | 0.95              |

| Keywords         | Centrality Values |
|------------------|-------------------|
| pride            | 0.24              |
| responsibility   | 0.24              |
| asking questions | 0.00              |
| posture          | 0.00              |
| dialogue         | 0.20              |
| top              | 0.98              |
| management       | 1.00              |
| commitment       | 0.59              |
| Communication    | 1.00              |
| 対応               | 1.00              |

## Conclusion of Step1

- ◆ RSMs consider that “education” and “training” would be keywords to recognize the current situation correctly.
- ◆ RSMs do not have their strong consciousness on the following keywords of “pride”, “responsibility”, “asking question”, “posture”, “dialogue”.

## Step2 Purpose

To clarify the **characteristics and issues** for RSC improvement of **higher ER (Education and research) sector** under comparison with the other sectors



# Step2. Review and comparison the characteristics in Higher ER sectors

## ◆ Targeting higher ER sectors (laboratory and university) in 5 sectors

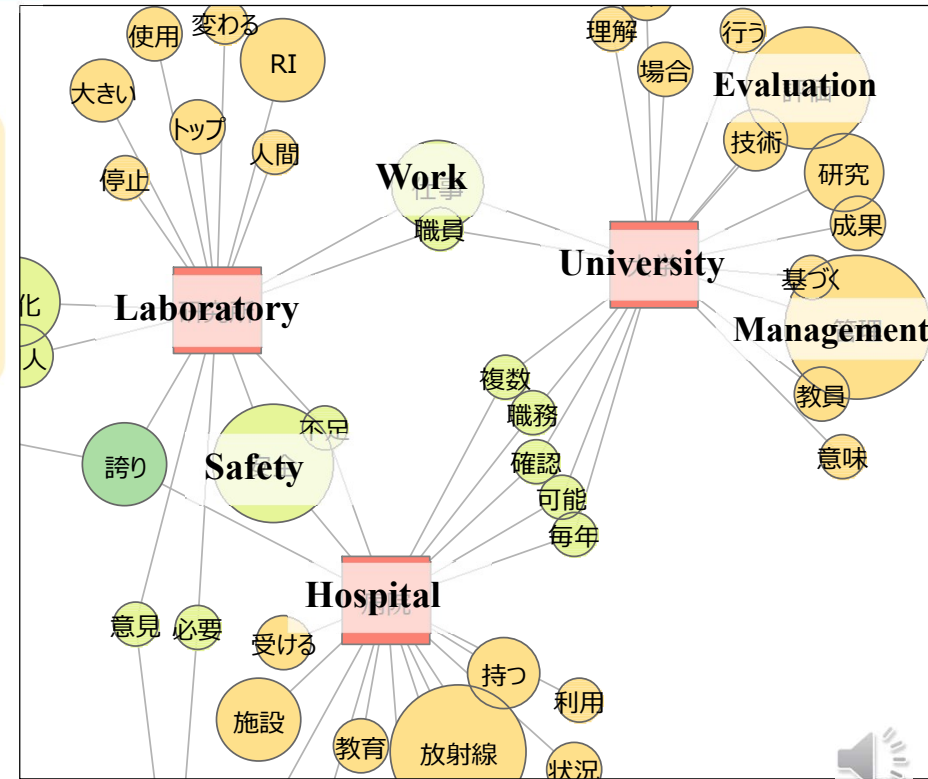


### Education and Research sector

**Review and comparison**  
of characteristics and trends of **5 sectors**  
to concretely characterize **higher ER sectors**

## ◆ Text Mining Analysis Co-Occurrence Network Analysis with facility information

Which words are frequent and important?



Co-Occurrence Network Analysis with facility information

## Step2. Conclusion Characteristics of higher ER sector

| Sector   | Characteristics   | Reason for characteristics  |
|--|---|---|
| <b>University Hospital</b>                     | Tend to hope a <b>new system</b> about evaluation method and professional team on activities for management and education | Representative example of RSM opinion<br>① We would not be respected and evaluated even if we work on safety management.<br>② We cannot work on safety management fully because we are also involved in other heavy tasks.                          |
| Irradiation Facility<br>Pharmaceutical Company | Tend to maintain and improve <b>current system</b>  | Representative examples of RSM opinion<br>① We need to revise the local safety rule of our facility to include aspects on the radiation security.<br>② Dissemination of RSM activities is needed because those might not be known to other members. |
| <b>Laboratory</b>                              | Tend to show their own strategy depending on their status   | <ul style="list-style-type: none"> <li>RSMs show variety on their answer because each laboratory owns different characteristic.</li> </ul>  |



## Step3. Effective Countermeasures in Higher ER sectors

### ◆ Purpose

To clarify **effective countermeasures** to fostering RSC for **Japanese** radiation facilities (to compare with those of other countries in the future)

### ◆ Main survey : Ranking Questionnaire

※based on **IRPA TG for RS Culture in HERT**

#### • Target

RSM & Radiation worker (N=334)

※Participant of The Second Joint JRSM-JHPS annual meeting

※Administrators and users of radiation facility in The University of Tokyo

### ◆ Complement survey : Interview

• To understand background and reason of the results of the ranking survey

#### • Target

RSM of UTokyo (N=18)

90min per a respondent

IRPA

**Task Group**

**on Radiation Protection Safety Culture**

**In The Higher Education,**

**Research and Teaching (HERT) Sector**

<http://www.irpa.net/page.asp?id=54693>

### Objective

To support and encourage the awareness and development of a strong radiation protection safety culture in the Higher Education, Research and Teaching (HERT) sector. The Task Group will build on the foundation set out in IRPA's "Guiding principles for Establishing a Radiation Protection Culture"; and will draw from the experience of IRPA's collaboration with IOMP and WHO to produce guidance in the HERT sector. The TG will aim to **produce guidance and "tools"** for radiation protection practitioners to **improve the radiation protection safety culture in the HERT sector**, and in so doing influence how the students of today foster the same approach in their future careers as the scientists and engineers of tomorrow.



## Step3. Contents of Selective questionnaire

### ◆ 10 points proposed IRPA Task Group for RS culture in HERT

- (1) Engagement of **Management**
- (2) Appropriate **Training**
- (3) Regular audit/**inspection** of radiation safety procedures/practices
- (4) Appropriate **management** of radioactive materials and radiation generating equipment
- (5) Appropriate appointment & use of Recognised **Experts & Officers**
- (6) Management of **staff doses**
- (7) Appropriate **Incident** handling
- (8) Effective **Communication**
- (9) **Resources**
- (10) Professional **Societies**

Based on **10 points** constituted **good approaches** about safety culture in The Higher ER sector

#### ➤ Main question

**What constitutes a good approach to Radiation Safety Culture in Higher Education and Research sectors of your country?**

(Please give a ranking from 0 (non) to 11 (highest))



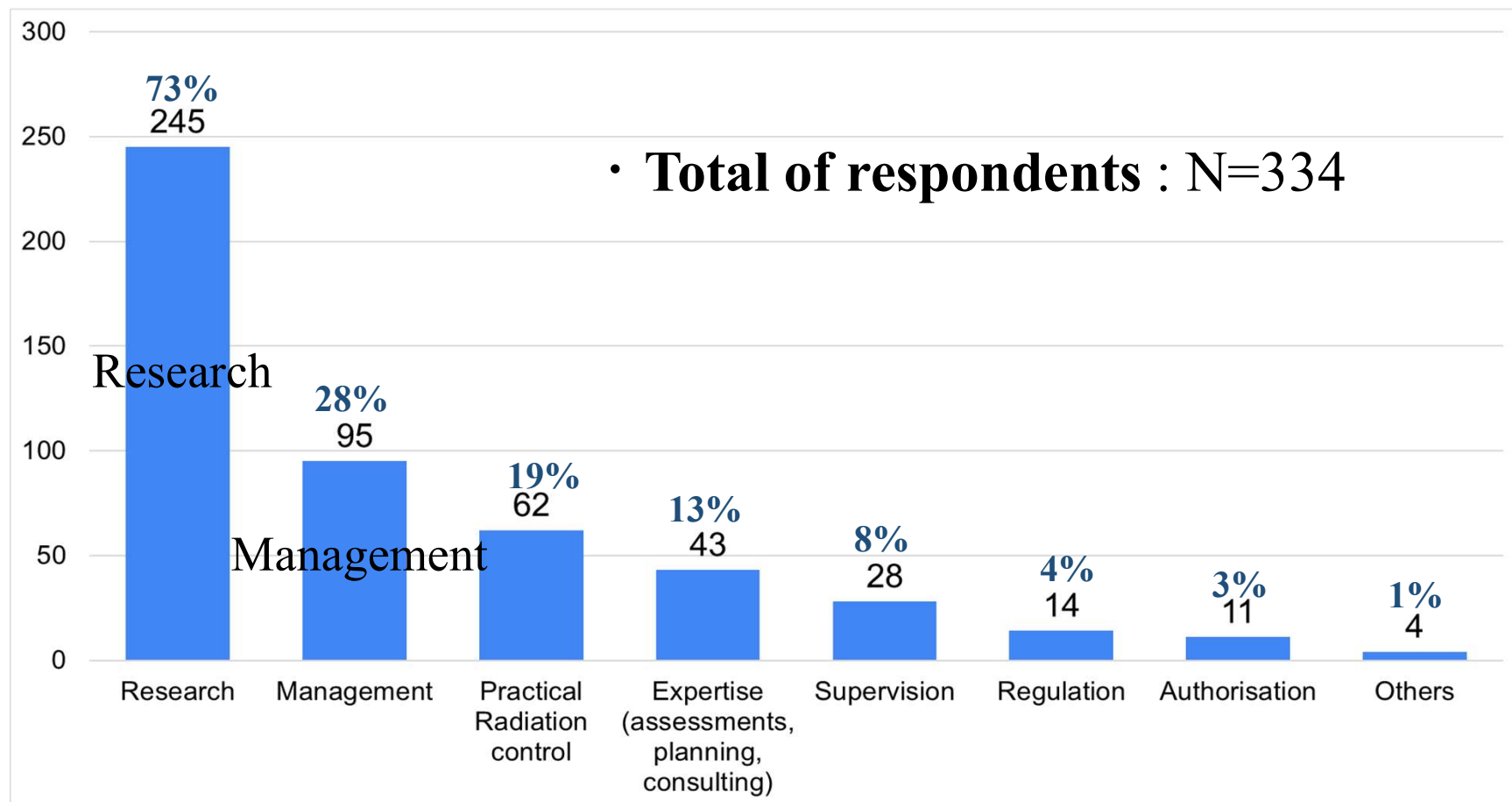


# Ranking Questionnaire

## Step3. Respondent Distribution

### Question

Your work on Radiation Safety Culture is related to:

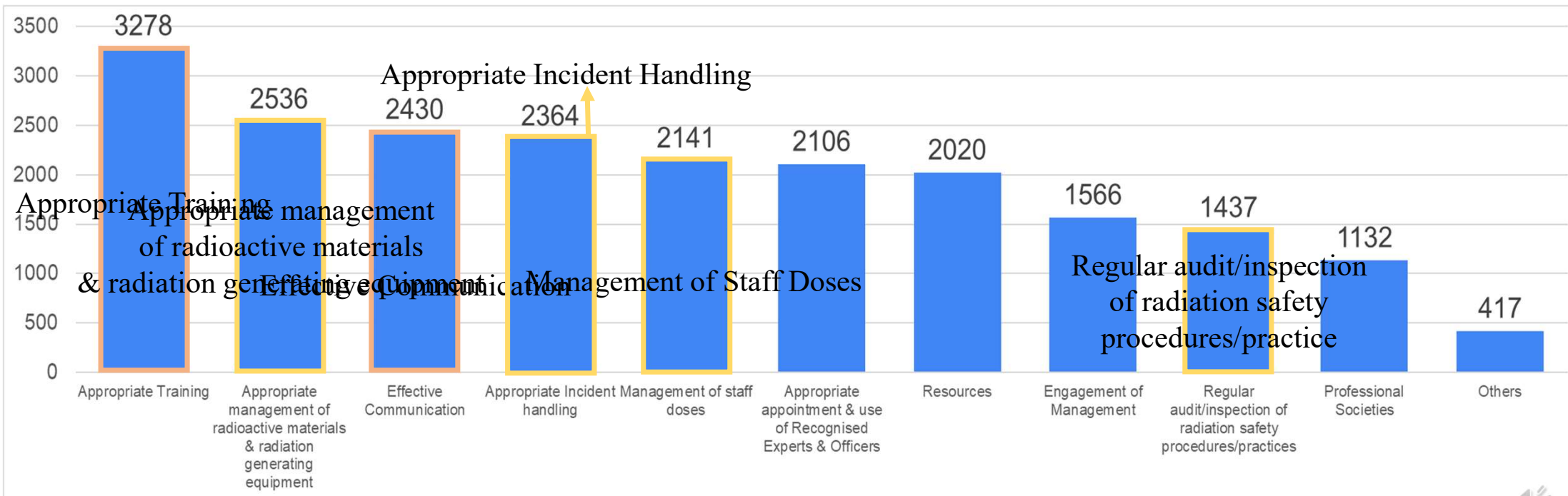


# Step3. Result Good approach to Radiation Safety Culture

## Question

**In your opinion, what constitutes a good approach to Radiation Safety Culture in Higher Education and Research sectors of your country?**

(Please give a ranking from 0 (non) to 11 (highest))



## Step3. Results and Discussion : Characteristic items

### Appropriate Training

- **Reasons listed in the top**
  - The **best opportunity** for all workers to understand **local rules** and **accident cases**
- **Problems and countermeasures**
  - Since it is held every year repeatedly, interest of radiation workers tends to reduce. Training materials and items should be reevaluated.
  - Training curriculum, tools, and methods according to the level of knowledge and skills of trainee are effective.

### Effective Communication

- **Reasons listed in the top**
  - We cannot timely and adequately deal with troubles and accidents without daily effective communication.
- **Problems and countermeasures**
  - Communication among all workers is difficult in large-scale facilities. therefore regular staff meeting is important.
  - We cannot explain what is “effective” communication. Standard evaluation index is needed.



# Ranking Questionnaire and Interview survey

## Step3. Results and Discussion : Characteristic items

- ① Appropriate management of radioactive materials and radiation generating equipment
- ② Appropriate Incident handling
- ③ Management of staff doses
- ④ Regular audit/inspection of radiation safety procedures/practices

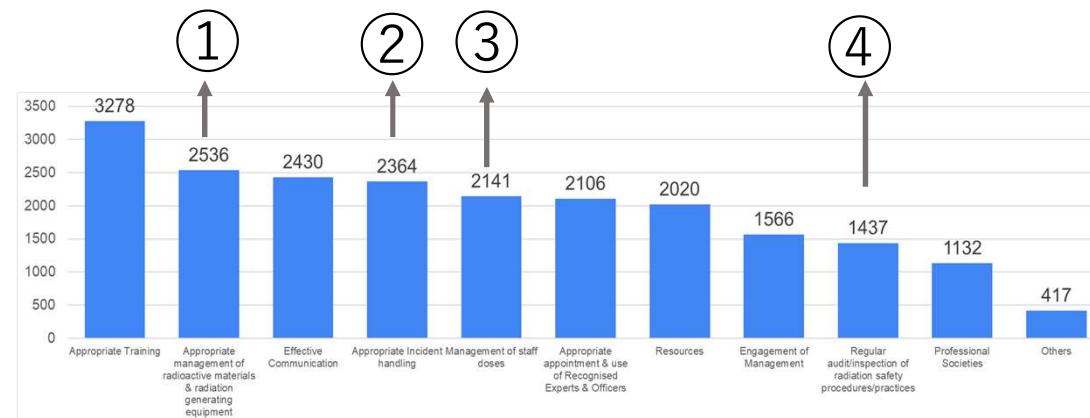
### These 3 items rank in the top 5

In research sector, the way to use radioactive materials or irradiators could be often changed. Therefore most of UTokyo RSMs tend to think that these are effective.

### Opposed opinions of UTokyo RSMs

Effective or not so for improve of RSC

All UTokyo RSMs think these items are **basic keys** for improvement of RSC. However these are **too natural** and **usual**. Some RSMs answered that these were not effective comparing the other items



# Conclusion

## Purpose

1. To survey the **latest status of consciousness on Radiation Safety Culture improvement** in Japanese radiation facilities
2. To discuss effective **countermeasures** for radiation facilities in the Japanese **Education and Research sector** .

### Step1

- ◆ RSMs consider that “education” and “training” would be keywords to recognize the current situation correctly.
- ◆ RSMs do not have their strong consciousness on the following keywords of “pride”, “responsibility”, “asking question”, “posture”, “dialogue”.

### Step2

- ◆ **University/Hospital**  
Tend to hope a new system about evaluation method and professional team on activities for management and education
- ◆ **Laboratory**  
Tend to show their own strategy depending on their status

### Step3

- ◆ **Appropriate Training**  
The **best opportunity** for all workers to understand local rules and accident cases
- ◆ **Effective Communication**  
We cannot timely and adequately deal with troubles and accidents without daily effective communication
- ◆ **Appropriate Incident handling**
- ◆ **Appropriate management of radioactive materials and radiation generating equipment**
- ◆ **Management of staff doses**
- ◆ **Regular audit/inspection of radiation safety procedures/practices**

## ★Future Plan

- **Comparing the results** of these analyses with those from **overseas** to characterize the differences in thinking between Japan and other countries.
- **Sharing issues and effective methods** will lead to the total improvement of RSC in the world.

**Opposed opinions of UTokyo RSMs**  
Effective or not so for improve of RSC

