

# **Implementation status on the medical examinations for workers engaged in radiation work in Fukushima Prefecture**

Occupational Safety and Health Department,  
Labour Standards Bureau  
Ministry of Health, Labour and Welfare

# Details for ionizing radiation medical examination, etc.

- The Ordinance on Prevention of Ionizing Radiation Hazards and the Ionizing Radiation Ordinance for Decontamination under the Industrial Safety and Health Act <sup>(Note 1)</sup> require submission of reports on the status of the periodical medical examinations (medical examination for ionizing radiation and decontamination workers, etc.) to the competent Labour Standards Inspection Office without delay.
- Furthermore, the Ordinance on Industrial Safety and Health also mandates the operation site with 50 or more workers on it to submit similar reports on the general medical examination.
- The MHLW issued the latest implementation status of medical examinations for workers engaged in radiation work and others within the jurisdiction of the Fukushima Prefectural Labour Bureau <sup>(Note 3)</sup> including the Tomioka Labour Standards Inspection Office <sup>(Note 2)</sup>.

(Note 1) Ordinance on Prevention of Ionizing Radiation Hazards at Works to Decontaminate Soil and Wastes Contaminated by Radioactive Materials Resulting from the Great East Japan Earthquake and Related Works.

(Note 2) The office that supervises workers at the Fukushima Daiichi and Daini Nuclear Power Plants. Almost all of the workers who undertook the medical examination for ionizing radiation workers in fiscal year 2012 were those who were engaged in works related to the nuclear power plants or decontamination.

(Note 3) Approximately 80% of the workers who undertook the medical examinations for ionizing radiation workers in fiscal year 2012 were those who were engaged in works related to the nuclear power plants or decontamination. The other 20 % included health care and medical workers and educational institution researchers.

## Ionizing radiation medical examination, etc.

The Ionizing Radiation Ordinance and the Ionizing Radiation Ordinance for Decontamination require full-time workers engaged in radiation and decontamination work to undertake periodical medical examinations regarding the following tests by a medical doctor at the time of employment and once within every 6 months thereafter (some tests can be omitted under certain conditions).

- (1) Investigation and evaluation on whether he or she has an exposure history (description of work, if he/she has radiation impairment or subjective symptoms, and others items relevant to radiation exposure)
- (2) White blood cell count and differential
- (3) Red blood cell count and hemoglobin content test or hematocrit test
- (4) Cataract eye test
- (5) Skin test

## General medical examination

General medical examination is required at the time of employment and once within every year (every 6 months for those engaged in specified work such as radiation work) on a regular basis.

- (1) Investigation of medical history and work history
- (2) Check for subjective and objective symptoms
- (3) Measurement of height etc., and visual and hearing acuity tests
- (4) Chest X-ray and sputum tests
- (5) Measurement of blood pressure
- (6) Anemia test
- (7) Liver function tests
- (8) Lipid blood tests
- (9) Glucose test
- (10) Urine test
- (11) Electrocardiography

# Rates of having an abnormal finding in the medical examination

## ● Rates of having an abnormal finding in the ionizing radiation medical examination

- The rates of having an abnormal finding: 6.50% (2010) → 6.90% (2012) as the national average; **2.81% (2010) → 6.26% (2012)** within the jurisdiction of the Fukushima Prefectural Labour Bureau; and **0.98% (2010) → 4.21% (2012)** within the jurisdiction of the Tomioka Office. All increased by 3 - 4 percentage points (Table 1).
- Of the tests (sampling survey within the jurisdiction of the Tomioka Office), "white blood cell count" had the highest rate of having an abnormal finding indicating **0.6% (2010) → 2.2% (2012)**. This increased by 1.5 percentage points (Table 2).

## ● Rates of having an abnormal finding in the decontamination medical examination (Table 1)

- **5.48% (2012)** as the national average and **5.48% (2012)** within the jurisdiction of the Fukushima Prefectural Labour Bureau (Table 1). The difference from that in the medical examination for ionizing radiation workers within the jurisdiction of the Fukushima Prefectural Labour Bureau is **0.78 points**.

## ● Rates of having an abnormal finding in the general medical examination (Table 3)

- The rates of having an abnormal finding: 52.48% (2010) → 52.69% (2012) as the national average, **and 52.10% (2010) → 53.11% (2012)** within the jurisdiction of Fukushima Prefectural Labour Bureau. This was a slight increase.
- **54.06% (2010) → 63.86% (2012)** within the jurisdiction of the Tomioka Office. This increased 9.80 percentage points (an increase of 11.50 percentage points in the lipid blood test).

**Table 1 Rates of having an abnormal finding in ionizing radiation and decontamination medical examinations**

		The rate of having an abnormal finding (%)		
		Nationwide	Within the jurisdiction of Fukushima Prefectural Labour Bureau	Within the jurisdiction of Tomioka Labour Standards Inspection Office
Ionizing radiation medical examination	2010	6.50	<b>2.81</b>	<b>0.98</b>
	2011	6.73	<b>5.73</b>	<b>3.14</b>
	2012	6.90	<b>6.26</b>	<b>4.21</b>
Decontamination medical examination	2012	5.48	<b>5.48</b>	

(Note) The reported number is significantly decreased in 2011 due to the earthquake

**Table 2 Comparison of the rates of having an abnormal finding compiled for each test (sampling survey)**

		White blood cell count	White blood cell differential	Red blood cell count	Hemoglobin content	Hematocrit value	Eye	Skin
Ionizing radiation medical examination (Note 1)	2010	<b>0.6%</b>	0.5%	0.1%	0.2%	0.0%	0.0%	0.0%
	2012	<b>2.2%</b>	0.8%	0.8%	0.5%	0.8%	0.1%	0.0%
Decontamination medical examination (Note 2)	2012	<b>1.8%</b>	0.4%	0.2%	0.2%	0.2%	0.1%	0.0%

(Note 1) One-fifth of the samples were extracted in the reports submitted during the period from July to December from the sites within the jurisdiction of the Tomioka Labour Standards Inspection Office.

(Note 2) One half of the samples were extracted in the reports submitted during the period from July to December from the sites within the jurisdiction of the Fukushima Prefectural Labour Bureau.

**Table 3 Rates of having an abnormal finding obtained from the general medical examination (for each test)**

(Note) The numbers in the blood-related tests are those extracted. Note however, that the numbers in the general remarks column are the total of all the tests.

		Rate of having an abnormal finding (%)				
		General remarks	Anemia	Liver function	Lipid blood	Glucose
Fukushima Labour Bureau	2010	52.10	7.99	17.09	33.78	10.68
	2012	53.11	8.34	18.41	35.23	11.41
Tomioka Office	2010	54.06	6.20	18.07	36.92	10.28
	2012	63.86	7.89	24.52	48.42	10.99

# Discussion I (Comparability)

- Discussion points regarding the rate of having an abnormal finding <sup>(Note)</sup> in the medical examinations are described as follows.

- The data of 2010 and 2012 **cannot be simply compared** because 70% of the sites within the jurisdiction of the Tomioka Office that reported in 2012 were different from those in 2010 (i.e., the two groups are not identical).

- When comparing the sites that reported the ionizing radiation medical examinations in 2012 with those in 2010 within the jurisdiction of the Tomioka Office, it was found that **382 out of 545 sites (70.1%) that reported in 2012 were different from those in 2010.**

- To evaluate changes in health through the comparison of the rate of having an abnormal finding in 2010 and 2012, additional information such as age distribution, lifestyles (habits of smoking, drinking, etc.), and medical history is required. However, such information is not included in the report.

(Note) "**have an abnormal finding**" means:

- The case where remarks were written by a medical doctor such as: "Detailed examination required", "Treatment required", or "Follow-up required". It should be noted that the reference value in the clinical test is conventionally determined so as to include roughly 95% of both subjectively and objectively healthy individuals who meet certain criteria (reference individuals).
- Also, "white blood cell count" **varies depending on other factors than radiation such as smoking and infectious diseases.**

# Discussion II (Impact of radiation exposure)

- When comparing the rates of having an abnormal finding in the ionizing radiation and decontamination medical examinations with the effective dose distribution, the difference of the rates was as low as 0.78 percentage points (Table 1) while the distribution of the radiation exposure doses differed significantly (Table 4). Thus, **the relationship between radiation exposure and changes in the rate of having an abnormal finding is unclear.**

(Table 1) The rates of having an abnormal finding in ionizing radiation and decontamination medical examinations

	Rate of having an abnormal finding (%)
	Within the jurisdiction of Fukushima Labour Bureau
Ionizing radiation medical examination	<b>6.26</b>
Decontamination medical examination	<b>5.48</b>

Table 4 Comparison of effective doses (within the jurisdiction of the Fukushima Prefecture Labour Bureau, 2012)

	Effective dose (Note 1)								Weighted average estimate (Note 2) mSv
	≤ 5mSv		> 5mSv ≤ 20mSv		> 20mSv ≤ 50mSv		> 50mSv < 100mSv		
	No. of persons	%	No. of persons	%	No. of persons	%	No. of persons	%	
Ionizing radiation medical examination	7,417	67.5%	2,074	18.9%	1,094	10.0%	400	3.6%	<b>10.26</b>
Decontamination medical examination	1,576	98.1%	22	1.4%	8	0.5%	0	0.0%	<b>2.80</b>

(Note 1) Cumulative annual dose of the previous year of the year when the medical examination was implemented

(Note 2) Calculated by multiplying the median of doses in each category by the number of examinees in each category, and dividing the sum of the multiplied numbers by the total examinees.

- There **is no particular relationship observed from** the general medical examination between the distance from the location of the Labour Standards Inspection Office to the Fukushima Daiichi Nuclear Power Plant, and the rate of having an abnormal finding (Table 5).

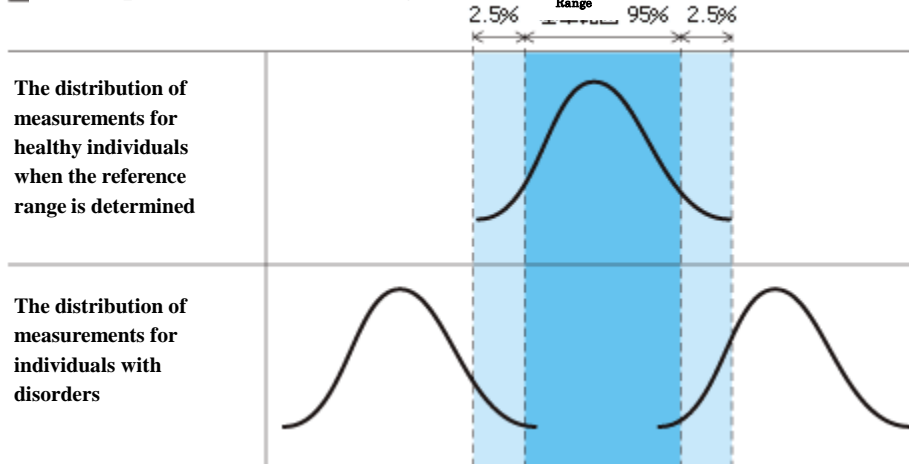
Table 5 Rates of having an abnormal finding obtained from the general medical examination (for each supervising office)

	Nationwide	Fukushima Bureau	Fukushima Office	Koriyama Office	Iwaki Office	Aizu Office	Kitakata Branch	Shirakawa Office	Sukagawa Office	Soma Office	Tomioka Office
2010	52.48	52.10	52.42	51.51	55.45	53.80	43.53	48.66	50.93	51.82	54.06
2012	52.69	53.11	52.12	53.24	56.85	53.31	47.67	48.37	53.32	54.56	63.86
Difference	<b>0.21</b>	<b>1.02</b>	<b>-0.30</b>	<b>1.73</b>	<b>1.40</b>	<b>-0.50</b>	<b>4.13</b>	<b>-0.29</b>	<b>2.39</b>	<b>2.75</b>	<b>9.80</b>

# Discussion III (Evaluation of the rate of having an abnormal finding)

- It was presumed that the increased implementation rate of approximately 20 percentage points (75% → 96%) (within the jurisdiction of the Tomioka Office) in the tests such as blood tests may have influenced the increased rate of having an abnormal finding in the ionizing radiation medical examination in fiscal year 2012.
  - ❑ The laws and regulations allow some of the tests (blood, eye, skin) to be omitted according to the exposure dose of the previous year and based on a medical doctor's determination. However, **few** tests have been omitted since the accident.
  - ❑ Consequently, the workers who undertook medical questionnaires but omitted blood tests in 2010 are counted in the denominator of the rate of having an abnormal finding (i.e., the number of examinees), but are not counted in the numerator (i.e., the number of examinees who have abnormal finding). This may have caused lower rates of having an abnormal finding in 2010.
- For this reason, a survey was conducted on the rate of having an abnormal finding for each test item such as the blood test, which indicated that the highest rate of having an abnormal finding was 2.2% in "White blood cell count" with only an increase of 1.5 percentage points (Table 2 ).
- It should be noted that there is a 5% probability that the test value falls outside the reference range even if one is a "healthy person" without health impairment. Therefore, the rate of having an abnormal finding of 2.2% can be considered to fall within the range

## ■ Concept of the reference range



**Table 2 Comparison of the rates of having an abnormal finding for each test (sampling survey)**

		White blood cell count	White blood cell differential	Red blood cell count	Hemoglobin content	Hematocrit value
Ionizing radiation medical examination	2010	<b>0.6%</b>	0.5%	0.1%	0.2%	0.0%
	2012	<b>2.2%</b>	0.8%	0.8%	0.5%	0.8%
	<b>Difference</b>	<b>1.5%</b>	<b>0.3%</b>	<b>0.7%</b>	<b>0.3%</b>	<b>0.8%</b>

# Actions by the MHLW

- The MHLW will take the following actions based on the medical examination results.

1. The MHLW provides instructions to TEPCO and the primary contractors to take the following actions.

(1) Implement appropriate follow-up actions based on the guidelines for follow-up actions <sup>(Note 1)</sup>.

(2) Provide instruction and support by the primary contractor to the involved subcontractors.

(3) Encourage the involved subcontractors to utilize the Fukushima Occupational Health Promotion Center and the Fukushima Prefecture Local Occupational Health Promotion Center.

2. Rigorous epidemiological studies, including investigations on age distribution, smoking, drinking, and medical history, are vital to understand radiation health effects. Therefore, the MHLW will conduct the necessary step-by-step epidemiological studies.

(1) Fiscal year 2013: Studies on cataract and thyroid

(2) Fiscal year 2014: Necessary studies will be conducted with a step-by-step approach, in addition to those conducted in fiscal year 2013.

(Note 1) Guidelines for actions that should be taken by employers based on medical examination results (Guidelines No.1 for actions based on medical examination results, 1 October 1996).

The guidelines include:

(1) recommendations on undertaking secondary medical examinations, (2) obtaining opinions from medical doctors regarding medical examination results, (3) determining actions on working conditions, (4) notifying of medical examination results, and (5) providing health guidance.