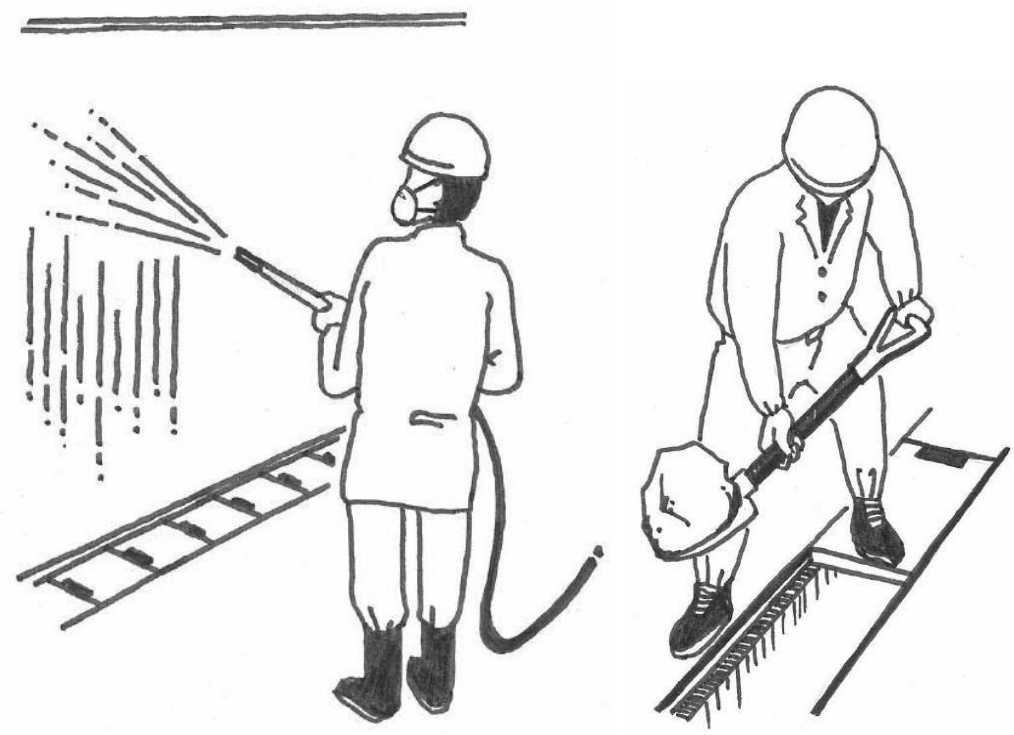
For workers engaged in decontamination related work

Guidance on the Prevention of Radiation Exposure during Decontamination Work



Follow rules, procedures, and instructions from your operation leader and minimize radiation exposure dose.

This brochure summarizes important points which workers, who are involved in decontamination work, need to be aware of.
You are encouraged to make a safety a top priority by observing safety precautions presented in this brochure and following the instructions of your operation leader

For people, their lives, and their future

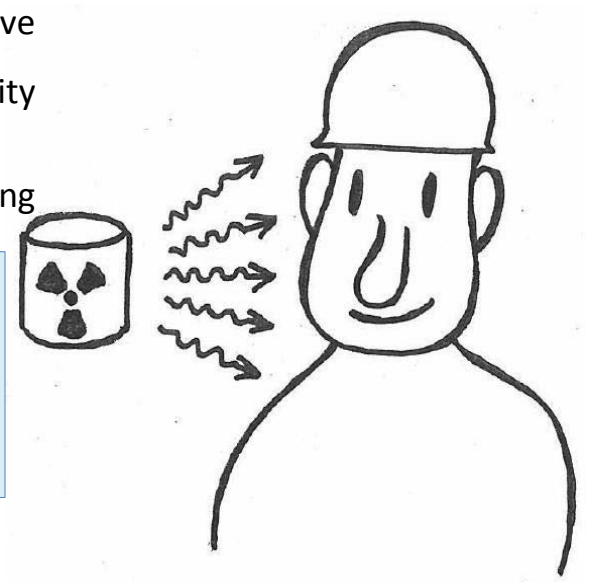
Ministry of Health, Labour and Welfare/ Prefectural Labour Bureau/ Labour Standards Inspection Office

1 External exposure and internal exposure

There are two types of radiation exposures: external and internal exposures. It is important for you to know the effective measures to protect yourself from each type of radiation exposure.

1) External exposure

You are exposed to radiation from radioactive materials that exist in the air.
Gamma-rays with high penetration capability are the main source of concern.

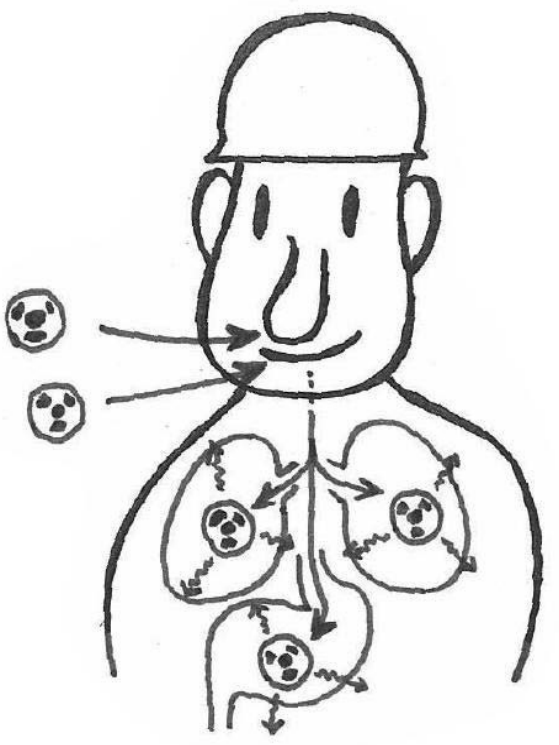


Following measures are effective in protecting yourself from external exposure:

- Removal of the radiation sources
- Shielding from radiation
- Keeping distant from the radiation sources
- Minimizing work hours

2) Internal exposure

You are exposed to radiation from radioactive materials taken into your body through inhalation or ingestion.
When your mouth and/or nose are contaminated with radioactive materials, there may be possibility of internal exposure.



The following measures are effective in protecting yourself from internal exposure:

- Keeping rest area clean
- Wearing protective equipment (e.g. dust masks) correctly
- Refraining from eating, drinking, or smoking while at work without the instructions of operation leader

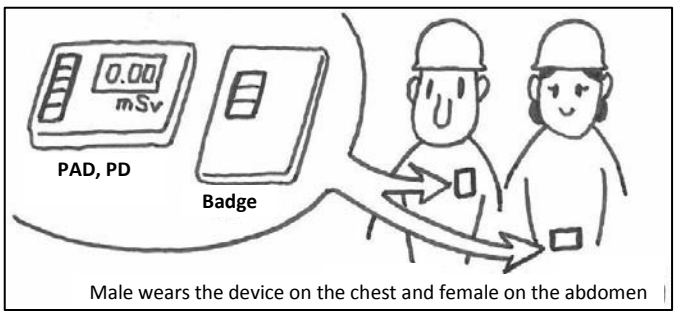
2 Monitoring your radiation exposure dose

You are obligated to correctly monitor your radiation exposure dose during decontamination related work.

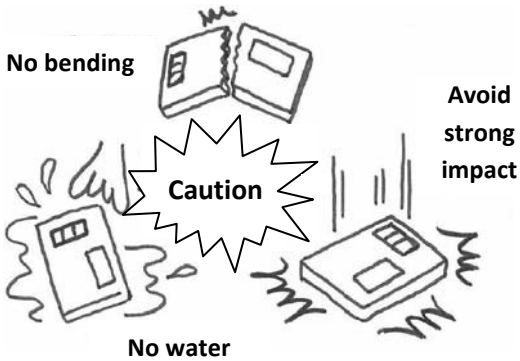
See page 8 for radiation and radioactivity units

1) How to monitor external exposure dose

Your external exposure dose is monitored by an electronic dosimeter (PAD, PD), glass badge, or luxel badge, which are individually worn. However, in areas where radiation dose rate is relatively low (less than 2.5μSv/h), only the exposure dose(s) of (a) representative worker(s) may be monitored.

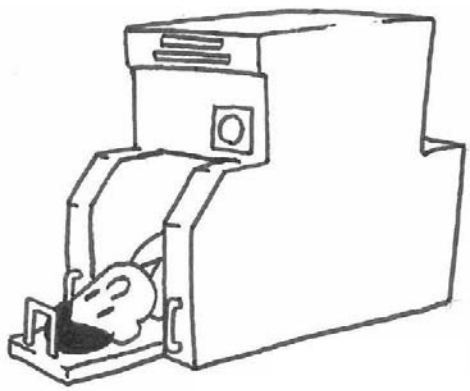


Male wears the device on the chest and female on the abdomen



2) How to monitor committed dose

If you are at work* that handles soil with high content of cesium and generates a large amount of dust, there may be possibility of internal exposure. Therefore, your committed dose is measured with a whole body counter (WBC) once every three months.
You may be inspected with the WBC after a screening test that involves identifying contamination inside your nose and dust mask, even when you are engaged in operations other than the aforementioned work.
Follow instructions of your operation leader.


Whole –Body- Counter (WBC)

*Work involving handling of highly radioactive contaminated soil (cesium concentration exceeding 500,000Bq/kg) and dust with a concentration exceeding 10mg/m3.

3) Exposure dose limit

Exposure dose limit is established for decontamination work as shown below. Do not exceed these limits.

100mSv per 5 years and 50mSv per 1

- 5mSv per 3 months for female workers (excluding infertile female workers)
- 1mSv per 3 months for pregnant women

It should be noted that your employer will issue a record of your radiation exposure dose every three months. Make sure you receive your record and keep it in a safe place.

3 Preparation before starting work

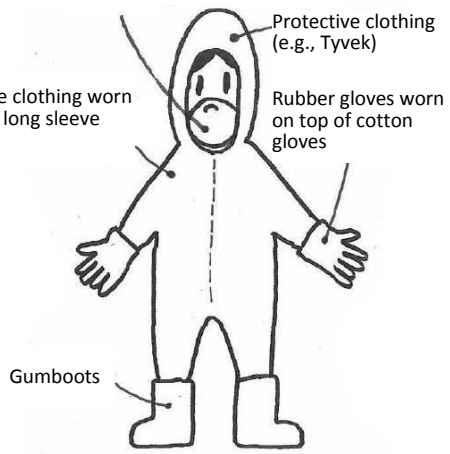
Ask yourself following questions before you start decontamination work.

1) Have you received special education?

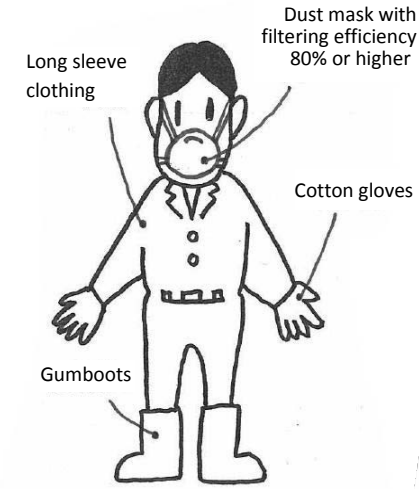
You must complete a special education program before you start decontamination work for the first time.
(The special education consists of 4 hours of lectures and 1.5 hours of practical training)

2) Are you equipped with proper equipment?

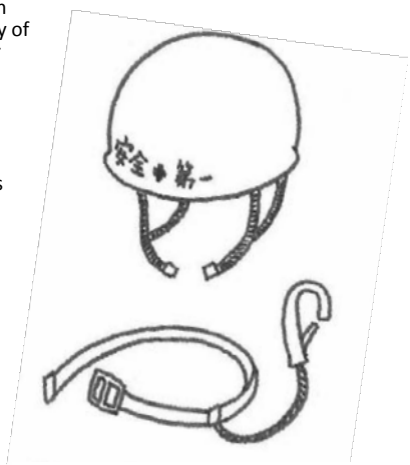
You need to wear prescribed clothing, gloves, and other equipment.



Precaution attire when internal exposure is likely

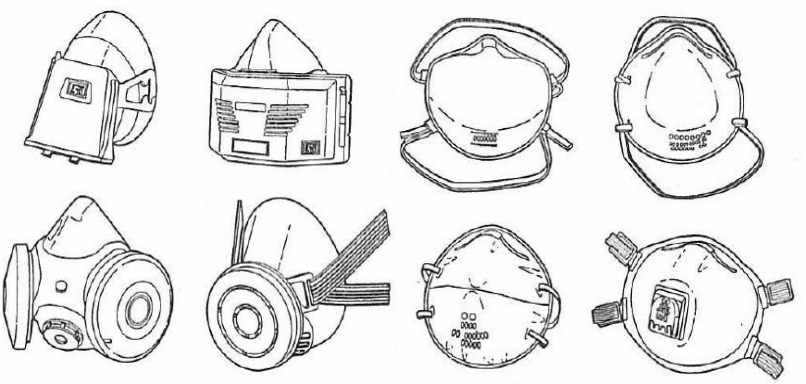


Precautious attire when internal exposure is unlikely



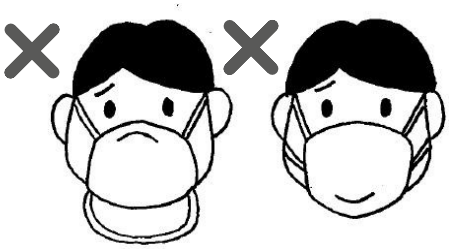
Wear a helmet and a safety belt when working in high places.

Wear prescribed masks correctly (a surgical mask may be acceptable where appropriate)



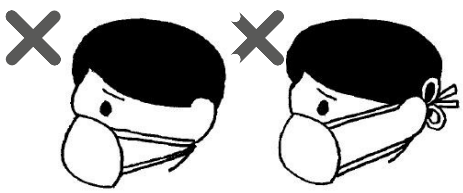
Filter replaceable dust masks

Disposable dust masks



One of the adjustable straps is coming off

A mask is worn upside down



Adjustable straps are overlaid at back of the neck

Adjustable straps are modified and hanging from ear lobes

3) Have you checked your work for the day?

Confirm in advance with your operation leader about your work for the day.

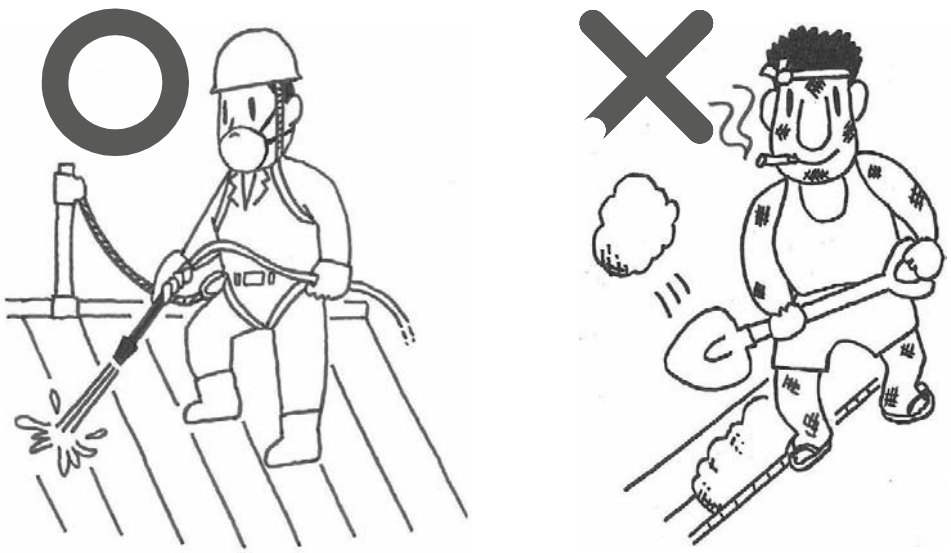
- What type of work and how long?
- What is the dose rate at the work site?
- Where are the rest area and the contamination survey station?

4 Safety precautions during work

Pay attention to the following issues when engaged in decontamination work.

1) Work methods and procedures

Observe prescribed procedures and work hours.

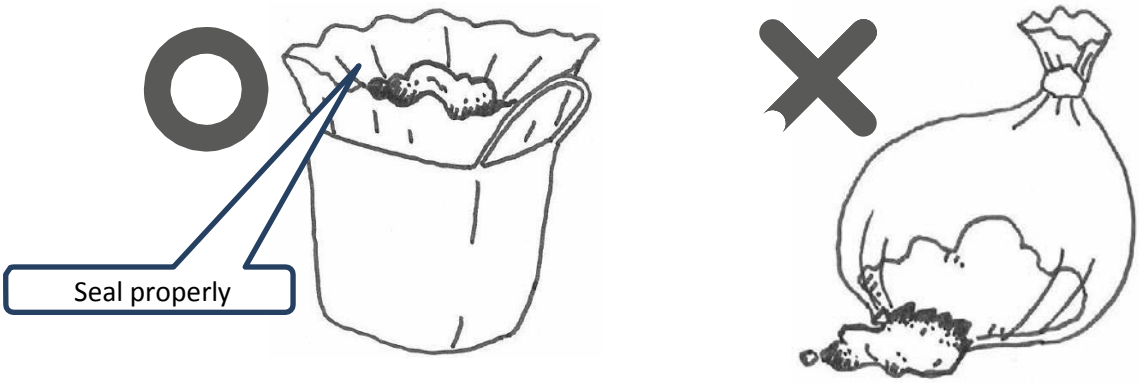


Sprinkle some water to control dust when engaged in work that could generate dust.
In addition, pay attention to the following precautions and protect yourself from contamination.

- Do not remove your gloves while working
- Do not touch your face or other parts of your body with your dirty gloves
- Do not rush when you are taking off your clothing and follow the procedures correctly
- Leave your shoes in a pair when you take them off
- Do not sit directly on the ground
- Keep contaminated items with radioactive materials in a plastic bag

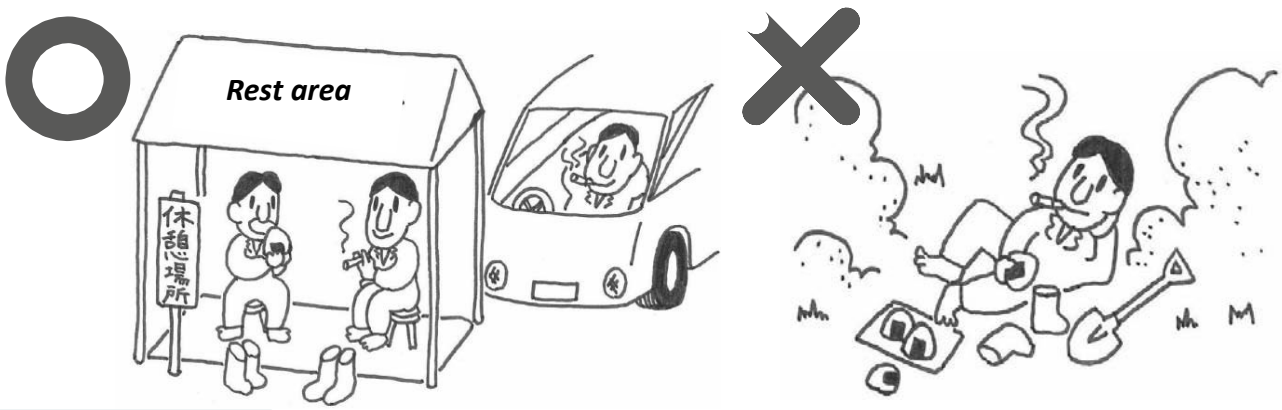
2) Storage of contaminated soil and wastes

Use designated containers for storing contaminated soil and wastes



3) Eating, drinking, and smoking in the rest area

Ensure that you take a rest break, eat, drink, or smoke in the designated rest area to avoid internal exposure.



4) When injured

You may get involved in an accident during decontamination work just as you would in any other outdoor work.

In the case of an accident,

Help (an) injured person/people and give them first-aid treatment

↓ Check if any wound is contaminated with a survey meter when necessary.

Call an ambulance (119) when necessary

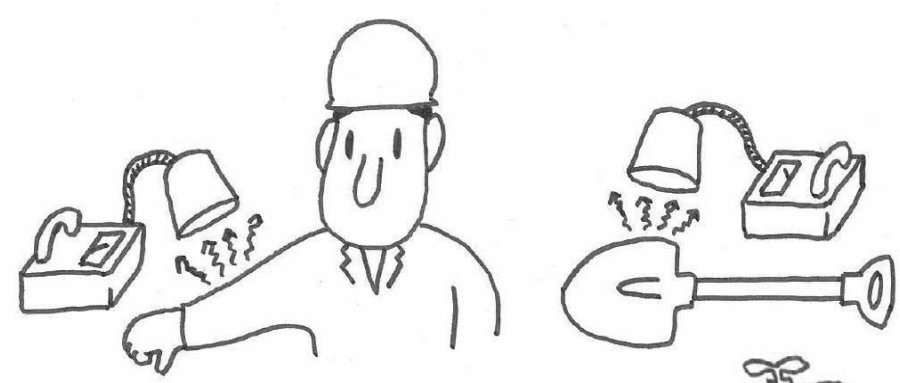
Follow the instructions of your operation leader and ensure safety during decontamination related work

5 Things to do after work

Take the following actions after finishing decontamination related work.

1) Contamination survey

You must receive a contamination survey either at your work site or at the designated survey station near your work site when you leave the decontamination related work site for the day.
The contamination will be assessed not only for your body, clothes, shoes, and protective equipment but also for other articles workers wish to take out from the work site.



When any part(s) of the body is(are) found to be contaminated, *wash the part(s) well with water**.
Immediately take off your clothes or equipment if they are identified as contaminated.
When articles workers wish to take out from the site are found to be contaminated, *these articles are not allowed to be removed from the site unless they are going to be used at a different work site, kept in a container, or washed.

Wash well

*You will be identified as contaminated if your levels of contamination exceed 40 Bq/cm2.
**Thoroughly wash until the contamination levels decrease to less than 40 Bq/cm2.

2) Medical examinations

Undergo special medical examinations, including an investigation of radiation exposure history, blood tests, eye and skin tests, at the time of employment and once every six months thereafter, if you will constantly be engaged in decontamination related work.

6. When you leave your job

When you leave the job of decontamination work, ensure that you receive the following records and keep them in a safe place:

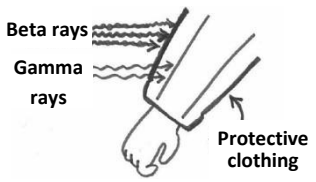
- A copy of your radiation exposure dose records
- A copy of your "ionizing radiation medical examination card for decontamination"

Basic knowledge of radiation

■Types and characteristics of radiation■

- There are various types of radiation. The major types of radiation are alpha ray, beta ray, gamma ray, and neutron.
- Radiation has the ability to penetrate materials called penetrability. The penetrability of radiation varies across the type of radiation.
- Cesium, a major concern during decontamination work, emits beta and gamma rays

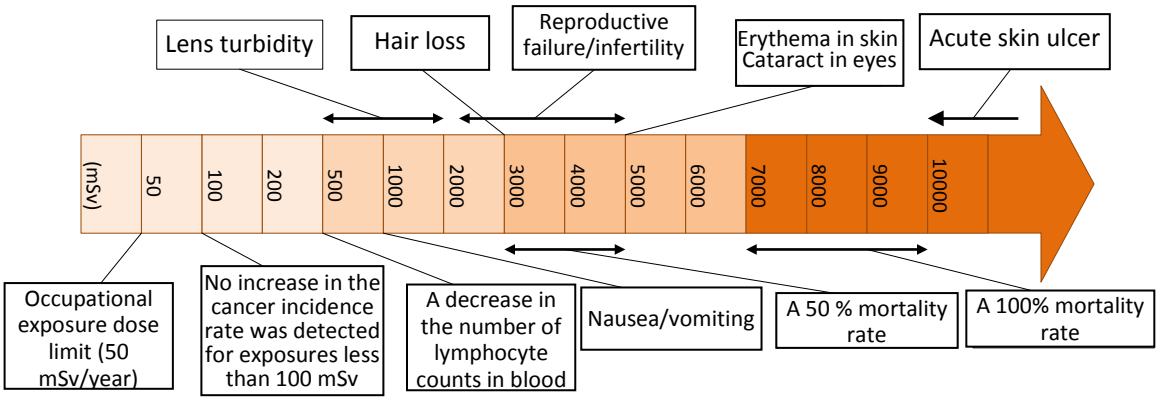
・Because beta rays have low penetrability, they are normally absorbed in the air and by protective clothing.
・Due to its high penetrability gamma rays are usually considered as the main radiation source that becomes a threat to our bodies during decontamination work.



- The characteristic of radiation emission (radioactivity) decreases over time. The radioactivity of cesium 137 can decrease to half of the original value in about 30 years.
- The following units are used to express intensity of radiation or radioactivity:
  ・**Bq (Becquerel)**: The unit is used to express the intensity of radioactivity. Bq/cm2 is the unit used to express the degree of surface contamination. Bq/kg is the unit used to express the degree of contamination in soil.
  ・**Sv (Sievert)**: The unit is used to express the effect of radiation on organisms. Common sub-multiples of the sievert are the millisievert (1 mSv = 1/1,000 Sv = 100 mrem), and the microsievert (1 μSv =1/1,000,000 Sv = 0.1 mrem).The unit of μSv/h is used to express dose received over one hour.
  ・**cpm (count per minute)**: Intensity of radioactivity measured by a radiation meter.

■Effects of radiation on human body■

The following schematically presents effects of radiation on each organ according to the levels of exposure dose. (source: "ICRP Pub. 60" and others)



- No clear medical evidence of the relationship between lower levels of radiation exposure (less than 100 mSv) and cancer incidence rate has been reported. Research on atomic-bomb survivors in Hiroshima and Nagasaki did not demonstrate any increase in cancer incidence rate among survivors who received radiation doses of less than 100 mSv.
- Therefore, the International Commission on Radiological Protection (ICRP) established the occupational exposure dose limit at "acceptable levels where no increase in cancer incidence has been reported." The Ionizing Radiation Ordinance for Decontamination (2-3 in page 3) adapted the same exposure limit as the ICRP.

Please contact your Prefectural Labour Bureau or Labour Standards Inspection Office, should you have further questions.