## Medical protective equipment

**Medical protective equipment** - this medicine, materials, and special tools to be used in emergency situations to prevent or reduce the effects of the impact of the damaging factors, medical assistance to victims and the prevention of complications.

**The requirements apply to MPE in emergency situations:**

- possible in advance of the start of exposure to damaging factors;
- simple methods of application, as well as the ability to store the public and rescuers;
- sufficient effective protective action;
- minimization or complete exclusion of the possible adverse effects of medical protective people and rescuers;
- *optimal economic characteristics:*

  - low-cost production,
  - prolonged periods of storage,
  - the ability to produce them in volume, to take fully into their communities and rescue .

**Medical protective drugs**

1.Used for radiation accidents (radioprotectors (radioprotective drugs)

2. Used for chemical accidents and household poisoning by various toxic substances (antidotes)

3. Used for prevention of infectious diseases and reduce the harmful effects on the body of toxins (antibiotics)

**The required amount of information:**

1) Knowledge of the general characteristics.
2) Knowledge of indications for use.
3) Knowledge of a "place" where they are stored.

**Radioprotective (radioprotective drugs)**

Radioprotective (radioprotective drugs) - medications that contribute to the weakening of the organism's reaction to exposure to ionizing radiation.

**The main sources of exposure to ionizing radiation on the body are:**

1.External exposure from radiation sources located within the zone of radioactive contamination;

2.Internal radiation (incorporated) in contact with radioactive particles into the body through the respiratory tract and / or gastro-intestinal tract.

The initial symptoms were under the influence of ionizing radiation on the body are called general primary reaction to ionizing radiation:

- Nausea,
- Vomiting,
- Headache,
- Psychotic reactions.

**Radioprotective drugs**

-Means preventing radiation damage with external radiation

-Means for preventing radiation damage incorporated radio-nuclides

-Funds warning conduct or the general weakening of the primary reaction to radiation

**Prophylaxis of radiation injury in the external radiation**

**Cystamine**

1) Has short period of radioprotective effect (sulfur-containing).
2) Tablets cystamine located in pencil case kits individual (АИ-2).

***Application:***

1. 30-60 minutes before exposure (upon exposure) of ionizing radiation
2. Duration of the radioprotective effect –

   4-5 hours.
3. Readmission is possible after 4-6 hours.
4. The recommended dose - 1.2 g - includes taking 6 pills to 0.2 g.

**Prophylaxis of radiation injury in the external irradiation**

**Indralin**

Refers to radioprotectors emergency action group of biogenic amines ***Application:*** For 15 minutes before exposure to ionizing radiation Duration of the radioprotective effect - 1 hour Readmission is possible after 1 hour. Recommended dose - 0.45 g - includes receiving 3 tablets of 0.15 g

Several radioprotective funds used to reduce the radiation damage to healthy tissue during radiotherapy and chemotherapy in cancer patients

1) **sulfur-containing radioprotective** Amifostine **administered intravenously**
2) **Amino-containingradioprotective** Mexamine applies to:

1-2 tab. 50 mg. 30-40 minutes before to each radiation treatment

**Prophylaxis of radiation injury in the external irradiation**

Under the impact of low-level radiation on radioactive contaminated areas assigned radioprotectors prolonged radioprotective effect to accelerate post-radiation recovery processes in the body.

Medicines to prophylaxis of radiation injury in the external irradiation:

-Riboksin

-Vitamins

-Aminoacids

**Riboksin**

***Application:***

The recommended dose - 2 tables 2 times a day for 30 minutes before meals for the duration of the contaminated area, the course - up to 1 month.

**Vitamins**

C (ascorbic acid),

B1 (thiamine),

B6 (pyridoxine),

P (rutin),

PP (nicotinic acid)

***Application:***

3-5 days before start of work on radioactive contaminated areas 3 times a day after meals, during the entire period of work.

**Aminoacids**

- Tryptophan,
- Histidine.

Mediate the effects due to the acceleration of the process of protein biosynthesis, biologically active proteins.

Of an accidental release of the highest risk in the first week of the isotopes are radioactive iodine. Early prevention of iodine stable iodine

***The Volkov-Chaikov^s effect*** **(1943)** characterized by inhibition of revenues iodine thyroid tissue, at the level of iodine in the blood by several orders of magnitude greater than its normal plasma concentration (10-20%).

**Prophylaxis of radiation injury in incorporation of radionuclides**

**Potassium iodide**

Ingestion of one tablet of potassium iodide (125 mg) of 99.5% prevents the accumulation in the thyroid radioactive iodine.

***Application:***

Before or within 30 minutes after the disaster. Blocking effect after 30 minutes. Adults and children older than 2 years –1 tablet (125 mg.) 1 per day, Children under 2 years are breastfed – 1/3 tablet (approximately 40 mg.) or 1 tabl. (40 mg.) 1 per day.

**5% Solution of iodine**

***Application:***

Before or within 30 minutes after the disaster. The course - up to 7 days

The recommended dose of 5% solution of iodine

**Adults and children older than 5**

| | | |
|---|---|---|
| **Adults and adolescents over 14 years** | 40 drops (1 ml.) (20 drops 2 times a day) | inside (with milk, jelly, sweet tea ) |
| **Children over 5 years** | 20 drops (0.5 ml.) (10 drops 2 times a day) | |
| **Children under 5 years** | | |
| **Children from 2-5 years** | 20 drops 1 times a day | Only the skin (forearm, calf) in strips or mesh 2.5% solution of iodine |
| **Children under 2 years** | 10 drops 1 times a day | |

**Lugol's solution**

*Application:*

Before or within 30 minutes after the disaster. The course - up to 7 days

The recommended dose

| Adults and children older than 5 | | |
|---|---|---|
| **Adults and adolescents over 14 years** | 20 drops (0.5 ml.) (10 drops 2 times a day) | Inside (with milk, jelly, sweet tea ) |
| **Children over 5 years** | 10 drops (0.25 ml.) (5 drops 2 times a day) | |

***Selective sorbents*** **-** radioprotective agent with ability to target due to radionuclides and their subsequent removal from the body

| | | |
|---|---|---|
| Strontium (Sr), Barium (Ba) | Adsorbar, Polisurmin, oxidizied cellulose, | |
| Plutonium (Pt) | Pentatsin | Inhalation |
| Cesium (Cs) | Ferrotsin, Bentonitic clay, Vermiculite, | |
| Uranus (U) Polonium (Po) | | Parenterraly |

**Means of preventing or reducing the total primary reaction to ionizing radiation**

*Initial reaction to the* ionizing *radiation:* nausea, vomiting, general weakness.

-Etaperazin

-Reglan

-Metoclopromid

-Latran - standard-issue antiemetic

**Medical protective equipment used in chemical accidents and household poisoning by various toxic substances**

**Antidotes**

- Are medical supplies chemical protection that can neutralize the poison in the body by physical, chemical interaction with it or provide a competitive interaction with the poison of the action on the enzymes and receptors.

**Terms of antidote therapy:**

- Conducted at confirming the application agents, distribution toxic substances and identification.
- Essential to obtain the maximum therapeutic effect is the earliest application.
- Possible prophylactic use antidotes immediately in front of the fireplace accident

**Antidotes are specific drugs inactivating only determinate chemical agents**

| chemical agents | Antidotes |
|---|---|
| **Organophosphorous poisons** | Atropin, Afin, Budaksim, Taren, Aprofen |
| **Cyanides** | Amilnitrit, Sodium tiosulfate, Antitsian |
| **Lewisite,**<br>**Arsenic poisons** | Unitiol |
| **BZ** | Triftazin, Galantamine, Bugafen |
| **Irritants:**<br>**- Adamsit,**<br>**- Chloroacetophenone,**<br>**- CS,**<br>**- CR,)** | Fitsilin, Antismoke mixture |

**MPE used for prevention of infectious diseases and reduce the harmful effects on the body of toxins**

**Antibacterial agents**

1) Nonspecific prevention

- antibiotics;

- sulfonamides wide spectrum,
- interferon

2) Specific prevention

- Serum
- Vaccines
- Toxoid
- Bacteriophages

**Special decontamination**

**Medical protective equipment** ensure effective implementation of the partial special decontamination to remove radioactive, chemical, bacterial funds from human skin

**Special decontamination**

**Partial** Provides for the elimination of aggressive substances from publicly held limited areas of the body (face, neck, hands, wrists)

**Full** Involves the processing decontomination of clothes, skin

The most effective way to prevent radiation damage skin if contaminated by radioactive dust is special treatment of it in soon as possible after contamination:

1) wash with soap and water;

2) subsequent use of the drug "Protection" and 1-3% solution of hydrochloric acid or sodium citrate.

For partial special decontamination to neutralize organophosphorus toxic substances, as well as poisons blister on exposed skin, clothing and personal protective equipment is used individual package of anti-gas in its various modifications (№ 8, 10, 11).

**Individual package of anti-gas № 8**

***Contains:***

1 glass bottle with liquid degassing, 4 gauze and instructions, packed in airtight cellophane tape.

***Application:***

1) open the package and moisten gause with fluid from the bottle;
2) wipe the exposed skin and the outer surface of the gas masks moistened gause;
3) moisten another gause and rub them the collar and the cuff of clothing adjacent to exposed skin;

4) moisten another gause and soak clothes in a place subject to it drops of the toxic substances blotting motion.

**Individual package of anti-gas № 10**

***Contains:***

Degassed liquid is in a metal cylindrical container with a cover-attachment

***Application:***

The processing is done by pouring into his palm and wiping her face, neck and hands: exposure to Vx (the entrance to the contaminated area)after working in the fireplace, immediately after getting them of the toxic substances. Fluid package has a disinfecting effect.

**Individual package of anti-gas № 11**

***Contains:***

Is a sealed package containing the cloth and the same liquid.

***Application:***

In addition to the degassing effect, a means to effectively treat burns, sores, ulcers, protects the skin from the effects of dilute solutions of acids and alkalis, fuels, lubricants, detergents, irritating the unprotected skin of organic substances.

**Individual package of dressing (IPD)**

Deactivation - removal of radioactive substances from the surface or from the masses of different environmental objects (buildings, clothing, equipment; water, food , etc). The main task of decontamination - reducing the levels of pollution by radioactive substances (see Isotopes, radioactive) to acceptable levels or concentrations. Significant importance is picking up and removal of radioactive waste (see).

The main methods of deactivation: 1) mechanical (water wash-out, wiping rags, or similar, in some sections, cleaning brushes, processing vacuum cleaners and sandblasting machines and other); 2) physical (dilution with water and others); 3) chemicals (acids, alkalis , etc); 4) physical-chemical (detergents, ion-exchange resins and so on); 5) biological (activated sludge and other).

For decontamination of surfaces, a mechanical methods: powders collect wet rags, solutions - filter paper and so on, then treated surface cleaning solution (powder "News" and others). In case of significant residual contamination, mechanically remove the cover of the table, a floor, plaster, etc. Equipment decontamination produce the same methods. For

decontamination of equipment from stainless steel apply nitric and hydrofluoric acid. Valuable equipment inactivate solutions lemon and oxalic acids (0,1-0,2%). Decontamination of protective clothing is achieved multi-stage processing of various detergents on the technology of washing oxalic (lemon acid, trylon B and other means.

Hands process using brush with warm water and soap. When contamination radioactive thorium or phosphorus should wash hands again soap with Trilon B, hexametaphosphate or detergent powder, when pollution radium - kaolin soap. To remove other radioactive substances used 1 -2% solution of sodium citrate or wetting of OP 10.

Decontamination of water and liquid radioactive waste is produced using a complex method, including mechanical (filters) and biological (biofilters) cleaning, coagulation and ion-exchange filters, as well as evaporation, foaming and other For decontamination of food used mechanical methods: wash water, remove the surface layer. Structural contamination of food (e.g., vegetables through the root system) decontamination difficult and ineffective. When contamination of short-lived isotopes products are stored for the period during which the radioactivity decreases to safe level by natural radioactive decay. The level of contamination of food decreases significantly when many processes: grain milling, manufacturer of melted butter and other. Quality control deactivation is carried out with the help of dosimetric and radiometric instruments.When carrying out decontamination you must follow the rules of work with radioactive substances, including dosimetric control (see) and sanitation (see) people engaged in these works.

**Decontamination in the military field conditions** is aimed at preventing or reducing the damaging effects of radioactive substances on the troops trapped in zones of radioactive contamination.

Decontamination in the military field conditions is the removal of radioactive substances from surfaces of weapons, military equipment, engineering constructions, personal protection equipment, clothing, footwear, equipment, as well as food and water. The most effective decontamination carried out soon after radioactive contamination. Depending on the completeness of the removal of radioactive substances decontamination in the military field conditions may be partial or complete.

Partial deactivation is carried out by the personnel of the troops. It involves removing the main quantity of radioactive substances from surfaces of objects and objects with which

compelled to come into contact personnel. Partial deactivation is carried out both on the infected and non-infected areas using mostly improvised. From the surface of infected objects and objects of radioactive dust is removed by a sweep of her branches, brooms or brushes or rubbing wet rags, rags and bundles of grass and snow, taken from the deep layers. Uniforms, bags, gas masks, cloak-capes, camp and other tents are extortion sticks. At partial deactivation of mobile military equipment (tanks, armored personnel carriers, and so on) and engineering constructions are processed and their inner surfaces. If a nearby water source, the surface of the subjects and objects of wash water. Partial deactivation of open fortifications is removed from the bottom of ditches, trenches, shooting cell surface layer of the earth thickness of 3-5 sm after sweep of radioactive dust with vertical and inclined surfaces. Full decontamination is complete removal of radioactive substances from all surfaces of the subjects and objects of military purpose or in reduction of contamination of these substances to levels that are safe for personnel. The effectiveness of the full decontamination controlled dosimetric devices (see ionizing radiation Dosimeters). Full decontamination is carried out by special units on the items of special treatment, deployed at sites outside of the contaminated zone. Complete removal of radioactive substances from all weapons and military equipment, equipment, footwear, protective clothing, masks, and other items, moisturizing which does not cause them harm, is conducted with a water jet or decontamination solutions using special technology. To be most effective when washing the use of brushes, brooms, rags, etc. Outfit with a strong radioactive contamination, is not reduced when extortion, subject washing in a special mechanized Laundry. Food and water while infecting them with radioactive substances are only full decontamination. For water purification using special water treatment equipment containing filter materials, which will be replaced periodically. Food contained in the solid hermetic containers, used only after careful handling of containers. Flour, cereals and other products that are enclosed in soft containers (bags), wet, dry and after the formation of surface crust pour into a clean bags, and the crust is destroyed. Meat and fish carefully wash out water. The use of food and water is allowed only after dosimetric control. The personnel involved in the conduct decontamination, is sanitary processing

**Individual package of dressing (IPD)**

Designed to blend aseptic wound dressings, burn surface, injury accompanied by pneumothorax.

IPD contains:

Two membranes: an outer rubberized fabric and inner - from paper.

Safety pins.

Dressings:

- Gauze bandage width of 10 cm and a length of 7 m

- 2 equal size cotton-gauze pads of size 17 × 32 cm. One of the pads sewn to the bandages, other connected mobile and can move freely along the length of bandage

**Occlusal (sealing) bandage**

First aid kit individual AI-2 is designed to provide self-help and mutual aid, to prevent or reduce the damaging effects of various factors, and prevention of shock in traumatic injuries.

**Slot number 1**

The syrnge-tube with 2 % Solution of promedol

**Slot number 2**

Pencil case round red. Contains 6 tablets preventive antidote named Taran.

***Application:***

1 tablet is taken on the team. If signs of poisoning to take 1 tablet of their own. Repreparation can take no earlier than 5-6 hours

**Slot number 3**

Long round white case with antibacterial agents number 2 - sulfadimetoksin (15 tab.)

Indications for use: gastrointestinal symptoms after exposure wounds and burns to prevent infection.

***Application:***

In the 1-day takes 7 tab., In the next 2 days - 4 tablets a day.

**Slot number 4** has two octagonal pink pencil box, containing 6 tablets radioprotective agent number 1 - cystamine.

***Application:***

30-60 minutes before entering the contaminated area should take 6 tablets.
If necessary, repreparation is allowed after 4-5 hours

**Slot number 5 contains two four-sided pencil case without coloring agent with antibacterial number 1 - chlortetracycline (5 tab. each)**

Indications for use: threat of bacterial contamination large wounds, burns to prevent suppurative complications.

***Application*:**

The first reception - 5 tab., Again (after 6 hours) for 5 tablets.

**Slot number 6 - four-sided white pencil box, containing radioprotective number 2 - Potassium iodide (10 tab. 0.25 g)**

**Slot number 7 - round blue pencil case containing one of antiemetics - latran, dimetpramid or etaperazin (5 tablets)**

***Application:***

1 tab. immediately after action of the ionizing radiation with nausea, vomiting.

**Promising areas of health protection and rescue in an emergency is to find and use new means of medical protection:**

1) Funds from the adverse effects of high temperatures

2) Funds from the adverse effects of low temperatures

3) Pharmacological agents correction of disorders caused by various toxic substances;

4) Medicines that increase human resistance to the combined effects of different nature of adverse factors specific to emergency