

Drugs of radiological pharmacology.

Report 7. Iodine

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Iodine (from Ancient Greek – «violet») is the chemical element with atomic number 53. Reactive non-metal belongs to the group of halogens.

Iodine was discovered in 1811 in seaweed ash. Under normal conditions, iodine is black-gray crystals with a violet metallic shine, easily forms violet pairs with strong smell.

Human body (weight 70 kg) contains 12-20 mg of iodine. The daily need in iodine is determined by age, physiological condition and body weight. For a middle-aged person of normal complexion (normostenic), the daily dose of iodine is 0.15 mg. Iodine is poisonous. The lethal dose (LD₅₀) for humans is 2-3 g.

The history of iodine application in clinical medicine is described in the work [4]. Iodine-containing contrast media are widely used in X-ray and tomographic investigations [5]. Iodine-131, like some other iodine radioactive isotopes, is used in medicine for the diagnostics and therapy of thyroid gland diseases. Isotope is widely applied in diffuse-toxic goiter (Graves' disease), some tumors treatment. According to the norms of radiation safety NRB-99/2009, adopted in the Russian Federation, the discharge from the clinic of the patient treated with iodine-131 is allowed only with decreased total activity of this nuclide in the body of this patient to the level of 0.4 GBq.

Recall, taking into account the state of modern pharmacoeconomics, the basic simple drugs based on iodine [5].

Iodine aqueous-alcohol solution 5% (Solutio Iodi spiritiosa 5%) contains iodine 5 g, potassium iodide 2 g, water and alcohol 95% equally to 100 ml.

Amyloiodine (starch iodide). The initiator of the new effective drugs based on iodine development is Vladimir Mohnach (1899-1974), doctor, candidate of chemical sciences and doctor of biological sciences, director of the Far Eastern branch of the Institute of Chemistry of the USSR Academy of Sciences, prisoner of Kolyma camps (1937-1956), where amyloiodine was created [7, 8].

Iodinol (iodine + polyvinyl alcohol) has a strong bactericidal effect on the yeast and pathogenic fungi, gram-negative bacteria and gram-positive – especially on *E. coli* and staphylococcus, has anti-dysenteric and anti-choleric effect. Even more resistant staphylococcus, with prolonged application in 80% of cases under the effect of iodinol perishes. But the *Pseudomonas aeruginosa* is resistant to iodinol.

Antistrumine (1 tablet contains 0.001 g of potassium iodide). **Iodobalance** (1 tablet contains potassium iodide active ingredient 130.8 µg or 261.6 µg, equal to 100 or 200 µg of iodine respectively).

Ioddicerine (iodine + dimethylsulfoxide) [6]. It is active against staphylococci, streptococcus, meningococcus, gonococcus, pneumococcus, escherichia (including enteropathogenic, invasive and toxicogenic strains), salmonella, klebsiella, proteus, serrations, cytotubercula, haemophilus influenzae, pseudomonads, fusobacteria, clostridia, nonclostridial anaerobes, peptococcus, mycoplasmas, herpes viruses, chickenpox, chlamydia.

Iodomarine potassium iodide – 131 µg (pure iodine 100 or 200 µg).

Calciodine (mixture of calcium salts of iodobegenic acid and other iodinated fatty acids).

Microiodine. Iodine – 0.0005 g, potassium iodide – 0.005 g, valerian root in powder – 0.05 g, pills mass – up to 0.25 g.

Povidone-iodine (polyvinylpyrrolidone iodine, active iodine concentration from 0.1% to 1%).

Energoiodine: structured water – 85%, dextran – 11g, dextrin – 2g, potassium iodide – 1,2g, iodine – 0,8g, polyvinyl alcohol – 0,3g, trace elements (iron, copper, zinc, magnesium).

It is known the antitumor effect of drugs based on iodine [1-3]. So, for example, diiodinesalicylic acid has an antitumor effect on inoperable forms of thyroid cancer. The cytostatic effect of iodides is associated with the action on the pituitary function mediated through the thyroid gland: the iodide administration causes a decrease in the estrogens synthesis in the body, due to the oppression of follicle-stimulating and stimulation of the luteinizing functions of the pituitary gland. The tumor growth inhibition was observed in different types of tumors with different hormonal dependencies. Characteristic for tumor cells membranes is an increased sensitivity to such destabilizing effects. Exactly the destabilization of membranes is observed as a result of the chaotropic action of the iodine anion [1].

Amizon (development of the Institute of Pharmacology of the National Academy of Medical Sciences of Ukraine) – isonicotinic acid derivative (enisamia iodide, N-methyl-4-benzyl carbamidopyridinium iodide) – non-narcotic analgesic with pronounced anti-inflammatory,

antipyretic, interferonogenic and immunomodulating action [2, 3].

The anti-inflammatory and antiexudative effects of amizon are largely due to the ability of the drug to stabilize the cell and liposomal membranes, normalize the metabolism in the inflammatory focus, actively regulate the inflammation focus metabolism, reduce the severity of vascular inflammatory reactions, actively regulate the metabolism of inflammation, inhibit the degranulation of basophilic granulocytes [5].

Amizon has antioxidant properties, normalizes the prostaglandins and cyclic nucleotides level that also explains its anti-inflammatory effect. The choice of amizon as the drug that enhances the radiation therapy anti-blast effect is due to the following reasons: the spectrum of its pharmacological activity, namely, anti-inflammatory and interferonogenic action; the presence of antitumor activity in iodine compounds. It was suggested to select patients with «identical» nosological forms of malignant tumors by the organism thermoreactivity for cooling to ensure maximum effectiveness of radiotherapy [2, 3].

Complete neoplasm regression was achieved only in patients with an adequate type of thermoreactivity (27 %); partial regression – in patients with an excessive type (27 %) and with an inert type (28 %), stabilization of the process – in patients with reduced type. Separation of patients by the type of thermoreactivity for cooling allows predicting in advance complete regression of laryngeal cancer after radiotherapy with the enhancement of anti-blast effect with amizon in patients with an adequate type of thermoreactivity.

Литература

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DRUGS OF RADIOLOGICAL PHARMACOLOGY. REPORT 7. IODINE

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13 drugs based on iodine are described: aqueous-alcoholic solution, amyloidin, iodinol, antistrunine, iodbalance, iododicerin, iodomarine, calciumiodine, microiodine, povidone-iodine, energy iodine, diiodsalicylic acid, amison. The experience of amizon application as a medicine that enhances the anti-blast effect of radiation therapy is described.

ЛЕКАРСТВЕННЫЕ СРЕДСТВА РАДИОЛОГИЧЕСКОЙ ФАРМАКОЛОГИИ. СООБЩЕНИЕ 7. ЙОД

Н.Н. Колотилов

Описаны 13 лекарственных средств на основе йода: водно-спиртовой раствор, амилоидин, иодиол, антиструмин, иодбаланс. иоддицерин, иодомарин, кальциййодин, микройод, повидон-йод, энергойод. дейодсалициловая кислота, амизон. Изложен опыт применения амизона в качестве лекарственного средства, усиливающего антибластомное действие лучевой терапии.

ЛІКАРСЬКІ ЗАСОБИ РАДІОЛОГІЧНОГО ФАРМАКОЛОГІЇ. ПОВІДОМЛЕННЯ 7. ЙОД

М.М. Колотілов

Описано 13 лікарських засобів на основі йоду: водно-спиртовий розчин, амілоїодін, іодиол, антиструмін, іодбаланс. іоддицерін, іодомарін, кальціййодин, микройод, повідон-йод, енергойод, дейодсалицилова кислота, амизон. Викладено досвід застосування амізону в якості лікарського засобу, що підсилює антибластому дію променевої терапії.