

Russian studies of the biological activity of small doses

M.S. Tomkevich

(National Association of Traditional and Complementary Medicine, Moscow)

Russian researches of low doses biologic activity

MS Tomkevich

(National Association for Traditional and Complementary Medicine, Moscow, Russia)

SUMMARY

The Russian founder of the study of small doses was the famous Russian pharmacologist Professor N.P. Kravkov. Since his research, there have been many evidence-based experiments, especially in the past 40 years. The experimental models used include different levels of organization - from cell-free enzyme-substrate systems, potentiated water, to cells, unicellular organisms, tissues, and whole cold-blooded and warm-blooded animals. The experimental conditions were different - "preconditioning", "postconditioning", potentiated solutions of high dilutions, non-potentiated solutions with low concentrations of substances. Several homeopathic medicines have been investigated in models recognized in pharmacology, which have shown effects known in homeopathy from provings and clinical experience. Other studies have been carried out on new substances (antibodies). Part of the research was carried out on models unusual in homeopathy - ciliates and aquatic animals. The effect of some substances became known from provings carried out in Russia. We can conclude the following: Russian researchers have made a great contribution to the development of homeopathy.

Key words: small doses, potentiated solutions, highbreeding, experimental models, provings.

RESUME

The famous Russian pharmacologist prof. Kravkov NP in 1924 y. was an initiator of low doses and homeopathic remedies biologic activity researches in Russia. From that time many evidencebased experiments were done. Last 40 years these studies were most intensive. Experimental models included different levels of organization - from a cellular fermentsubstrat solution, potentiated water, till cells, singlecell organisms, tissues, whole cold and warm blooded organisms. There were different conditions of experiments - "preconditioning", "postconditioning", potentiated high dilutions solutions and nonpotentiated low concentration solutions. Some homeopathic remedies were studied on models recognized in pharmacology and demonstrated characteristics wellknown in homeopathy. Some of them were done from new substances, for example, antibodies. Some of them were studied on rather unusual models of aquatic animals. Some characteristics were clarified from proving. We can conclude that Russian scientists and homeopathists have made a great contribution to the development of homeopathy.

Keywords: low doses, potentiated solutions, high dilutions, experimental model, provings.

The outstanding Russian pharmacologist N.P. Kravkov, who for several years studied the effect of a number of substances - adrenaline, histamine, nicotine, strychnine, ether, chloroform, etc. on the vessels of an isolated rabbit ear and pigment cells of living frogs and came to the conclusion that the chemicals he studied in concentrations of 10^{28} - 10^{32} clearly act on living cells, and this action is opposite to their own action in commonly used doses [1]. RAS Academician I.P. Ashmarin suggested that the effect of low doses is associated with a cascade amplification and convergence of a biological signal [2]. RAS Academician P.V. Simonov [3] showed when studying the processes of excitation and inhibition that small and homeopathic doses are most effective when the body is overexcited and ceases to respond to strong stimuli. The higher the degree of arousal of the organism, the more effective the effect of small doses and homeopathic remedies. In fact, he supplemented ArndtSchultz's rule by formulating the following provisions: "As the dose (strength) of various influences (caffeine, chemical stimulants of leukocyte reactions, penetrating radiation, mechanical trauma), there are three phases of change in unconditioned reactions: initial oppression, arousal and secondary (transcendental) inhibition. The depth and duration of these phases depend on the strength of the impact ". For example, the use of caffeine manifests itself in a two-phase effect, arousal is replaced by inhibition, and the duration of these multidirectional effects, depending on the dose, can be different. This pattern is very important. "It can be assumed that it is precisely her that is empirically used by homeopaths in those cases when they receive a sufficient therapeutic effect," wrote P.V. Simonov. He gives a number of examples of the opposite direction of the action of small doses compared to medium ones. Essential in the nature of the response and the dose required for this is the functional state of that body system which the drug acts on. It should be remembered that we are always dealing not with the action of this or that substance, but with its interaction with the organism, with its physiological functions. In response to a large dose, one can always see the balancing reaction of the body and its turn in the opposite direction. Currently, they also describe differently the direction of action of ultra-low doses and homeopathic medicines, depending on the initial state, which is denoted by the terms "preconditioning", "postconditioning" [4]. So, in 1954, academician P.K. Anokhin [5] found that after the introduction of adrenaline, the activity of systems that lower blood pressure is activated. In the case of low doses, the opposite response is not observed. The continuation of these studies in the field of medical science was the research of prof. Kudrina A.N. [6], who conducted research on the action of highly diluted solutions of drugs on the vessels of the frog's mesentery, showed that adrenaline has a vasodilating effect when diluted with 16C. The attitude to homeopathy has divided scientists into two groups: those who do not recognize this phenomenon a priori and do not want to study it, and those who carefully and gradually begin to explore this natural pattern. It is about the fundamental

research should mainly speak in relation to homeopathy.

ON THE. Tushmalova [7] in the article "On the biological significance of ultra-low doses" writes: "without considering the general biological content of the phenomenon of ultra-low doses, it is impossible to understand the purely medical aspect ... And the consideration of the biological significance of ultra-low doses allows us to classify modern homeopathy as a science reflecting the basic pattern of environmental tactics - minimizing external influences of the environment while maintaining the predicted optimal effect. " A.M. Kuzin [8, 9], considering the role of ultra-low doses of radiation, writes: "The evolution of life on our planet has revealed a remarkable feature of living organisms to use ultra-small amounts of many physical and chemical factors - harmful and poisonous in large quantities, for their prosperity."

Researchers of the phenomenon of the action of homeopathic medicines in high dilutions should take into account both the peculiarities of homeopathy and those patterns that have already been identified in our time when working with ultra-low doses of substances and weak effects of physical factors. In our country, the study of ultra-low doses and weak effects has been carried out for more than 40 years thanks to the initiative of scientists from the Institute of Developmental Biology named after N.K. Koltsov RAS, Scientific Research Institute of Biochemical Physics RAS, Scientific Research Institute of Organoelement Compounds. Academician A.N. Nesmeyanov, Research Institute of Theoretical and Experimental Biophysics, Russian Academy of Sciences, etc. It should be recognized the special role of research carried out in research teams led by prof. Yamskova V.P. and prof. Burlakova E.B. Prof. Yamskova V.P. with colleagues opened a new group of endogenous bioregulators, *in vitro*, as well as *in vivo* in experimental models [10, 11]. After a series of studies, prof. Burlakova [12, 13] pointed out the complex polymodal nature of "dose" dependencies, the fundamental possibility of influencing different biological systems, the instability of the magnitude of the effect, etc. E.B. Burlakova [12] defined the concept of ultra-low doses as doses, the effectiveness of which cannot be explained from the currently generally accepted positions, and the development of new mechanisms is required. Domestic authors have also shown that small and ultra-low doses have an effect against the background of the continuing action of commonly used doses of the same substances [14, 15]. This has been shown for therapeutic and toxic doses of many drugs and some OPs. Toxicologists studying the effect of ultra-low doses note a non-monotonic dose-effect relationship, change in the sensitivity of a biological object to the action of ultra-low doses of different substances, the presence of kinetic paradoxes at the level of the "ligandreceptor", the dependence of the "sign" of the effect on the initial characteristics of the biological object, the stratification of the properties of biologically active substances as the concentration decreases, when the activity remains, but side effects disappear [14] ... A study was carried out to determine the survival rate of rats with the introduction of OPV against the background of premedication with a potentiated drug of the same OPV in D6, D12, D30. It was shown that in such a formulation of the experiment, the dilution of D12 increased the life span by 1.6 times. With the problem of the effect of small and stratification of the properties of biologically active substances as the concentration decreases, when the activity remains, but side effects disappear [14]. A study was carried out to determine the survival rate of rats with the introduction of OPV against the background of premedication with a potentiated drug of the same OPV in D6, D12, D30. It was shown that in such a formulation of the experiment, the dilution of D12 increased the life span by 1.6 times. With the problem of the effect of small and stratification of the properties of biologically active substances as the concentration decreases, when the activity remains, but side effects disappear [14]. A study was carried out to determine the survival rate of rats with the introduction of OPV against the background of premedication with a potentiated drug of the same OPV in D6, D12, D30. It was shown that in such a formulation of the experiment, the dilution of D12 increased the life span by 1.6 times. With the problem of the effect of small and

extremely low doses and paradoxical reactions to them have to be dealt with in toxicology [16, 17]. Thus, in the works on the analysis of the causes of the "Gulf War Syndrome" (1991–1998), the role of low doses and concentrations of sarin vapors at the level of safety standards for the working area and settlements adopted in the United States is discussed. These are concentrations of the order of 10^{14} - 10^{18} M. About the "paradoxical reaction" write other authors who investigated the effect of ultra-low doses on the germination of plant material. So, for example, the concentration of nitrosomethylurea 10^{24} - 10^{29} M was found to be more effective for germination of spruce and tomato seeds than the commonly used 10^3 M [18]. On the model of *Salmonella typhimurium*, the genetic activity of ultra-low doses of bleomycin and 2nitrofluorene was studied, a multidirectional effect was shown on the number of mutants formed at concentrations of 10^{15} M and 10^{22} M. [19].

The effect of homeopathic medicines has been studied in various models. A number of drugs were studied for their effect on the proliferative activity and apoptosis of blood cells *in vitro*. Shown, that *Thuja*, *Lycopodium*, *Arsenicum album*, as well as the GCSF peptide in C6 and C30 dilutions increased the proliferative potential of granulocyte macrophage progenitor cells, *Aurum met.* did not possess such an effect. The drugs *Aurum met.*, *Lycopodium*, *Arsenicum album*, GCSF showed a pronounced antiapoptotic effect on mononuclear cells. *Thuja* did not have such an effect in this setting of the experiment [20]. O. Yu. Tretyakov, B.L. Hurwitz [20] reported that the immunosuppressor FK506 at concentrations of 10^{10} - 10^9 M does not have an inhibitory, but, on the contrary, a stimulating effect on cells. A number of authors [22, 23, 24, 25] on different cell models confirm the positive effect of ultra-low doses and potentiated chemotherapy drugs on the course of the oncological process. Ryabykh T.P. et al. [25] showed that melatonin at concentrations of 10^{11} - 10^{13} M retained the ability to inhibit the growth of malignant cells *in vitro*.

The effect of the potentiated antioxidant phenosan in dilutions D15, D20, D25, synthesized at the Research Institute of Biochemical Physics, on the index of motor activity of *spirostoma*, the viscosity of the cell membrane, the interaction of acetylcholinesterase-acetylcholine was investigated. It was shown that phenosan diluted with D25 significantly increased the viscosity of the membrane, the activity of the enzyme-substrate complex, and the motor activity of the ciliate *spirostoma* [26].

Using a seed germination model, the biological effect of D1 – D30 and C1 – C30 dilutions of *Natrium chloridum* and *Saccharum officinale* substances on the control of non-potentiated and potentiated water in the corresponding dilutions [27] was studied and a non-monotonic effect on germination was shown. For example, the authors observed a significant inhibition of germination in dilutions D7, D10, D13, D19, D24, C17, C23, C25, C27. Inhibition of germination was also noted in some samples with potentiated water in dilutions D5, D8, D12, D20, D29, C10, C15, C21, C26, C30.

There is evidence that phenazepam in small doses 10^{10} - 10^{11} M / kg in the case of intact animals showed a selective anxiolytic and moderate anticonvulsant effect, without the side effects characteristic of

applied dose [28] 10⁵-10⁶ M / kg. The effect of potentiated morphine on the dopamine content in the brain of experimental animals has been shown. Morphine in this experimental design in the C30 dilution reduced the dopamine content in the septum, and in the C200 dilution increased it [15].

Taking into account the importance of water in the process of homeopathic technology, experiments were carried out on aquatic organisms - ciliates and fish of various species. It was shown that homeopathic preparations Arsenicum album, Calcarea carbonica, Ignatia, Nux vomica in dilutions C6, C12, C30 changed the spontaneous locomotor activity of ciliates [29]. Lebedeva N.E. et al. [30, 31] conducted a study of a potentiated preparation from fish skin on the behavior of different fish species (carp, tilapia, salmon, etc.) using a stress model (handling). It turned out that the effect of the initial substance at a dose of 10 g / l and homeopathic dilutions of the substance is opposite. A dose of 10 g / l against the background of stress worsens stress indicators, homeopathic dilutions (D15 - D17), when added to the water of finding fish, prevent its development, promote sedation, which is reflected in the biological and physiological parameters of fish. A systematic study of the luminescence of aqueous solutions of the homeopathic preparation Natrium muriaticum in dilutions from D1 to D30 (Weleda in Moscow) was carried out [32]. It is shown that the dependence of the luminescence intensity on the degree of dilution is a non-monotonic function with several maxima, the main of which corresponds to D13 - D14. The change in luminescence in a series of dilutions was compared with their biological activity, which was studied by the motor activity of ciliates with Spirostom. A significant negative correlation was established between the mobility of ciliates and the intensity of luminescence, as well as the difference in the spectra of potentiated and non-potentiated water used as two controls. Analyzing the properties of water, V.I. Lobyshev [33] writes about that water, as a non-equilibrium system, sensitive to weak influences and possessing the properties of self-organization, can structurally and chemically change during the preparation of a homeopathic medicine and be the cause of the arising primary biological effects. Recently, works have appeared in which the formation of nanoassociates in water in the process of potentiation is described [34]. According to the authors, they are the reason for the manifestation of "anomalous" physicochemical properties by water systems. A decrease in chaotic Brownian motion in the process of potentiation of aqueous solutions has also been shown [35]. can structurally and chemically change during the preparation of a homeopathic medicine and be the cause of the arising primary biological effects. Recently, works have appeared in which the formation of nanoassociates in water in the process of potentiation is described [34]. According to the authors, they are the reason for the manifestation of "anomalous" physicochemical properties by water systems. A decrease in chaotic Brownian motion in the process of potentiation of aqueous solutions has also been shown [35]. can structurally and chemically change during the preparation of a homeopathic medicine and be the cause of the arising primary biological effects. Recently, works have appeared in which the formation of nanoassociates in water in the process of potentiation is described [34]. According to the authors, they are the reason for the manifestation of "anomalous" physicochemical properties by water systems. A decrease in chaotic Brownian motion in the process of potentiation of aqueous solutions has also been shown [35].

One of the experiments confirming the specific effect of homeopathic medicines was a study conducted by a group of authors [36] to study the effect of four drugs - Ignatia, Nux vomica, Argentum nitricum, Hyosciamus in D30 dilution in psychopharmacological studies in rats. The control groups received diazepam at a dose of 1 mg / kg, and in the other group, at a D30 dilution. At the same time, the preparations Ignatia and Nux vomica showed anxiolytic effect on the model of "conflict situation" according to Vogel, without showing activity on other models. Argentum nitricum reduced fear of heights when tested in the elevated cruciform maze model, and Hyosciamus had a universal anxiolytic effect in the above models, as well as

on the "open field" model, surpassing in this experiment the well-known effects of control diazepam and control with potentiated diazepam.

Another study examined the mechanism of action of the drug Influcid (DHU), recommended for use in influenza. A study conducted at the Research Institute of Epidemiology and Microbiology. N.F. Gamaleya, showed a pronounced antiviral activity [37] of this drug.

An experimental study of the peculiarities of the action of small doses was an essential step towards the creation of a wider line of drugs on the basis of ultra-low doses of antibodies, which are used in the clinic with a good effect [15]. The effectiveness of these drugs has been well studied experimentally and clinically, and the developers were awarded the RF Government Prize.

A separate series of studies, characteristic only of homeopathy, is provings - proposed by F.H.S. Hahnemann's methods of studying the properties of drugs. In Russia, provings were carried out for the following substances: *Vulpes vulpes*, *Cacao theobroma* [38, 39], Mammoth tusk, *Chamerion angustifolium* [40, 41], *Lynx lynx*, *Panthera uncia*, *Canis fam boxer*, *Panthera onca*, Black panther, *Ciconia ciconia*, *Picus viridis*, *Colibri amazilia*, *Pica pica*, *Turdus pilaris*, *Vipera lebetine*, *Chamaeleo parsoni*, *Lacerta agilis*, *Infans bufo*, *Muraea*, *Cyprinus carpio*, *Acipenser ruthenus*, *Tapinella atrotomentosa*, *Callophrysula pilaris*, *Zapi-nipe-paris*, *Satrici papilli*, *Papillio-papillio* *Polygonia calbum*, *Araschnia levana*, *Apatura iris*, *Didymachus picipes*, *Ajuga reptans*, *Amelanchier alnifolia*, *Atriplex hortensis*, *Daucus carota*, *Rubus chamaemorus*,

Summing up the review, it should be said that Russian researchers have made a significant contribution to the study of the biological activity of small doses and homeopathic medicines, outlined ways to understand the mechanism of action of these compounds. Research is ongoing and we are awaiting new interesting results.

LITERATURE

1. Kravkov N.P. On the threshold of sensitivity of protoplasm // *Uspekhi experimental biology*. - 1924. -- Vol. 3. - No. 3-4.
2. Ashmarin I.P., Karazeeva E.P., Lelekova T.V. To the question of development Problems of the effectiveness of ultra-low doses of biologically active compounds // *Russian Chemical Journal*. - 1999. - Vol. 43, No. 5. - pp. 21-27.
3. Simonov P.V. Reflection theory and psychophysiology of emotions. - M., 1970.
4. Tomkevich M.S. Experimental research in homeopathy // *Traditional medicine*. - 2011, No. 2. - P.8-18.
5. Anokhin P.K. Selected works: Cybernetics of functional systems / Under ed. K.V. Sudakov. Compiled by V.A. Makarov. - M.: Medicine, 1998. -- 400 p.
6. Kudrin A.N. Influence of small doses of adrenaline on the vessels of the frog mesentery // *Symposium of the Academy of Sciences "Mechanisms of action of ultra-low doses*. - 1991. - pp. 15-16.
7. Tushmalova N.A. On the biological significance of ultra-low doses // *International Medical Journal*. - 1999, 9-10. - pp. 547-549.
8. Kuzin A.M. Secondary biogenic rays are the rays of life. - Pushchino, 1997. -- 36

With.

9. Kuzin A.M. Electromagnetic information in the phenomenon of life // Journal "Biophysics". - 2000. -- T. 45, issue 1. - pp. 144-147.
 10. Yamskova V.P., Yamskov I.A. The mechanism of biological action of physical chemical factors in ultra-low doses // Russian chemical journal. - 1999. - Vol. 43, No. 2. - P.74-79.
 11. Yamskova V.P., Krasnov M.S., Maltsev D.I. et al. To the question of the mechanism biological action of ultralow doses // [www.biophys.ru/archive/congress2012/proc. - p98d.pdf](http://www.biophys.ru/archive/congress2012/proc.-p98d.pdf)
 12. Burlakova E.B. Features of the action of ultra-low doses biologically active substances and physical factors of low intensity // Russian chemical journal. - 1999. T. 43, No. 56. - P.3-11.
 13. Burlakova E.B. The effect of ultra-low doses // Bulletin of the Russian Academy of Sciences. - 1994. Vol. 64, No. 5. - Pp. 425-429.
 14. Tochilkina L.P. The phenomenon of ultra-low doses, homeopathy and FOV // J. Chemical and biological safety. - 2007. - No. 1 (31). - P.5-14.
 15. Epshtein OI Release activity (modern view on homeopathy and non-homeopathy). - M.: publishing house RAMS, 2017. --- 48 p.
 16. Bulatov V.V., Khokhlov T.Kh., Dikiy V.V. and others. The problem of small and ultra-small doses in toxicology. Fundamental and applied aspects // Russian chemical journal. - 2002, 6. - P.58-62.
 17. Loshadkin I.A., Goldenkov V.A., Dikiy V.V. etc. - Cases of mass diseases of "unclear etiology": toxicological aspects. The role of small doses of physiologically active substances // Russian chemical journal. - 2002. - P.46-57.
 18. Shangin Berezovsky G.N., Moloskin S.A., Rykhletskaia O.S. Paradoxical effect of microdoses of NDMM and PABA depending on the sensitivity of the test material // Chemical mutagenesis in the creation of varieties with new properties / Ed. Rapoport I.A. - Moscow: Nauka, 1986. - pp. 243-245.
 19. Vasilyeva S.V., Makhova E.V. Genetic Activity of Super Low Doses antitumor antibiotics and 2nitrofluorene: ecological aspects of the problem // Izvestiya RAN, Biological series. - 1996, 6. - P.676-680.
 20. Tomkevich M.S., Osipova E.Yu., Sharova O.V., Vladimirskaya E.B. Investigation of the hemostimulating effect of some homeopathic preparations on the ex vivo model // Nauchnoprakt. conference "Traditional methods of treatment - the main directions and development prospects." - M., 1998. -- p. 196.
 21. Tretyakov O.Yu., Gurvits B.Ya. Immunosuppressant FK506 in low concentrations acts as an immunostimulant in vivo // International Symposium "Fundamental Sciences and Alternative Medicine". - Pushchino, 1997. - P.29.
 22. N. P. Konovalova The antitumor effect of super small doses is biologically active compounds // In the book: 1st symposium "Prospects for the use of ultra-low doses of drugs in oncology." - M., 2000. - pp. 28-29.
 23. Novozhilova T.I., Malokin S.I., Kurochkin V.K. et al. Action
-

of some cytotoxins in ultra-low concentrations on the cellular link of immunity // 1st symposium "Prospects for the use of ultra-low doses of drugs in oncology." - M., 2000. - p.21-22.

24. Fomina M.M., Ostrovskaya L.A., Corman D.B. Cytogenetic features of the influence of ultra-low doses of cytostatics on tumor cells // 1st symposium "Prospects for the use of ultra-low doses of drugs in oncology." - M., 2000. - pp. 22-24.

25. Ryabykh T.P., Bodrova N.B., Nikolaeva T.G. et al. Melatonin: action small doses on the proliferation of human tumors in vitro and violation of the rhythms of synthesis in cancer patients // In the book: 1st symposium "Prospects for the use of ultra-low doses of drugs in oncology." - M., 2000. - pp. 25-28.

26. Burlakova E.B., Goloshchapov A.P., Zenin S.V. et al. Some objective indicators of the action of potentiated solutions of ultra-low doses // Moscow International Conference "Unsolved Issues of Homeopathy". - M., 1997. -- p. 11.

27. Lobyshev V.I., Tomkevich M.S. Physical properties and biological activity of diluted solutions // International J. High Dilutions Research 2018, 17 (1): 10

28. Epshtein O.I. The effect of various dilutions of potentized agents in experiment // Mosk. International Homeopathic Conference. - 1998. - p.21.

29. Lebedeva N.E., Tomkevich M.S., Tushmalova N.A. Influence of the ultra-small concentrations of water-soluble compounds from fish skin on the behavior of aquatic organisms // International Symposium "Fundamental Sciences and Alternative Medicine". - Pushchino, 1997. -- p. 17.

30. Lebedeva N.E. - Effects of exposure to chemical and physical nanodoses factors on aquatic animals // Traditional medicine. - 2016, 2 (45). - pp. 20-28.

31. Lebedeva N.E., Tomkevich M.S., Vasilene M.Z. etc. The effect of ultra-small concentrations: the effect of fish skin extract on the physiological parameters of aquatic organisms // Journal "Biophysics". - 1999. - T.44, No. 4. - pp. 728-730.

32. Lobyshev V.I., Tomkevich M.S., Petrushanko I.Yu. Experimental study of potentiated aqueous solutions // Journal "Biophysics". - 2005, 50, 1. - P.404-409.

33. Lobyshev V.I. Modern ideas about the structure and properties of water // Fundamentals of Homeopathy. - M., 2004. -S.218-227.

34. Konovalov A.I., Ryzhkina I.S. Nanoassociates as a possible baseline element of fundamental scientific foundations of homeopathy // Matly of the 1st Eurasian Congress on homeopathic medicine. - M., 2016. - P.76-78.

35. Novosadyuk T.V. Laboratory quality control of homeopathic medicines using the method of visual microscopic observation of the effect of dynamization // Matly of the 1st Eurasian Congress on homeopathic medicine. - M., 2016. - pp. 84-85.

36. Molodavkin G.M., Voronina T.A., Chernyavskaya L.I. Opportunities practical use of drugs in ultra-low doses (for example, phenazepam) // In the book: 1st symposium "Prospects for the use of ultra-low doses of drugs in oncology." - M., 2000. - S. 12-14.

37. Garashchenko T.I., Iliencko L.I., Garashchenko M.V. et al. Organization experience nonspecific prophylaxis of influenza and ARVI using complex homeopathic preparations in school collectives // Journal of Pediatrics. - 2015. - T.94, No. 4. - pp. 122-127.

38. Ashikhmina M.V. Cacao theobroma. Test results // Practical homeopathy. - 1 (9), 2008. - pp. 40-55.

39. Ashikhmina M.V. Case and proving of *Vulpes vulpes* (common fox) // Practical homeopathy. - 1 (12), 2011. - pp. 47-64.

40. Popov D.A., Popova S.N., Fadiev A.V. Mammoth ivory test 30C // 70 1st LMHI Congress - August 25-29, 2015, Riode Janeiro, Brazil.

41. Popova S.N. , Popov D.A., Fadiev A.V. et al. Test of fireweed narrow-leaved 30C (*Chamerion angustifolium* 30C) // In: Materials of the 1st Eurasian Congress on homeopathic medicine. - M., 2016. - pp. 172-175.

42. Fatula O.A. - fatula.ru

Author's address

Dr. med. Tomkevich M.S.

mtomkevich@gmail.com

Tomkevich, M.S. Russian studies of biological activity of small doses / M.S. Tomkevich // Traditional medicine. 2018. No. 1 (52). P.1318.

[To favorites](#)