III. КОРОТКІ ПОВІДОМЛЕННЯ

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PREVISION BY J.A. RAPOPORT OF SECONDARY MUTAGENESIS IN ROW OF CELLULAR GENERATIONS

The mechanism of chemical mutagenesis was opened, studied and implemented in practice by a world famous scientist, J. A. Rapoport. He discovered that the chemical substances — ketonic connections, alkylating agents are interacting with active groups of proteins in the cytoplasm and chromosomes. Thereby he anticipated the phenomenon of formation in cells of the secondary mutagens.

Diversity of cultural plants is possible to get by the inducing of the genetic, in other words of the hereditary changes. For achieving of g enetic variety a using of chemical mutagens is necessary. The searches of chemicals able to cause the hereditary changes began both abroad and in use after opening by H. J. Müller of mutagenic action of the X-rays [1]. N. K. Kolzov is the prominent Russian biologist — geneticist predicted the idea of matrix reproduction of chromosomes. He the first supposed that mutations could arise up not only from an ionizing radiation but also under the action of chemicals.

Follower of N. K. Kolzov, V. V. Saharov [2] by adding to larvae and pupas of *Drosophila* by the solution of iodine was getting sex-link mutations in the second generation of flies. Analogical experiments carried out with an ac. a. and ammonia by M. V. Lobashov [3, 4]. Ammonia did not cause mutations. The level of mutations for adult individuals under impact of the iodine or acetic acid exceeded a natural level. In 1939 S. M. Gershenson published work about induction of mutation at *Drosophila melanogaster* under the action of sodium salt of timonucleic acid [5].

In 1946 in England by Charlotte Auerbach and Joule Robson were published as short reports about induction of mutations among adult males of *Drosophila* after affecting on larvae of poison substance of mustard gas (allyl isothiocyanate, yperite) [6, 7]. Authors discovered to 24% of sex-link mutations. A great geneticist by Joseph (Iosif — in Russian-language literature) Abramovich Rapoport worked up theory and method of chemical mutagenesis as the phenomenon. In opinion of J. A. Rapoport [8], in the earlier mentioned works there was low mutational activity and were not represented the

convincing data about effects of the tested substances and about their genetic effects.

J. A. Rapoport began the experimental search of substances able to induce mutations, before Great patriotic war the participant of which he was. After return from an army he published the article in 1946 [8]. He showed the origin of mutations at adult individuals of *Drosophila* after treatment of larvae and eggs by formaldehyde, aldehydes, urotropine and other ketonic connections. In that investigation [8] high-frequency of lethal mutations analyzable on the method of ClB (estimation of lethal mutations for adult individuals with the marker sign of eyes as stria of Bar) was got. Formaldehyde when you add at nutrient larvae medium induce 6%, and in some experiments 12 and 30% of lethal and visible mutations against less than 0.12% in the control. As well as after a short-wave radiation, ketonic connections caused the «tufts of similar changes». Subsequent works of J. A. Rapoport were completed by creation of the theory of chemical mutagenesis. J. A. Rapoport marked the fundamental difference of action of short-wave radiation as of mutagen from the action of chemical mutagens [9]. A radiation causes the breaks of chromosomes with subsequent confluence of the torn fragments in different combinations; as a result are arising of dominant mutations. Mustard gas operates similarly [9]. J. A. Rapoport [6, 9–11] explains the action of ketonic connections and alkylating agents, when they penetrate in the cells, that they interact with amino groups, what results in the irreversible changes of proteins of cytoplasm and genic proteins. Thus recessive mutations appear mainly unlike the breaks of chromosomes after a short-wave radiation [12]. In experiments with adding of chemical agents to the nutrient medium of culture of drosophila the mutagen presents there constantly. J. A. Rapoport supposed that the co-operating of chemicals with proteins in a cytoplasm and chromosomes determines mutagenicity of these connections.

This capacity for cooperating of chemical mutagens with proteins in a cell predetermined the preservation at them of mutagens and was causing appearance of mutations or transpositions in row cellular generations.

Considerably later classic works of B. N. Sidorov and N. N. Sokolov on the seedlings of well-known cytogenetic object of *Crepis capillaris* have showed that a mutagen an ethylene imine causes new rearrangements of chromosomes in row of cellular generations [13, 14]. After treatment of seedlings of the plant the mutagen were washing off at tap water. These authors showed also, that an ethylene imine is interacting in a cage with biologically important substances, such as amino acids or the predecessors of DNA [15]. These complexes the authors have named by the secondary mutagens. Appearance of the new rearrangements of chromosomes in cell generations got the naming «the secondary mutagenesis».

In the works [16, 17] J. A. Papoport in detail analyzed objective laws of origin of the lethal mutations from alkylating agents, likeness of effect of chemical and of radiation mutagens, fundamental difference of the chemical mutagenesis from effect of the ionizing radiation. He opened the supermutagenes [18] were provoking the large number of the heritable changes. Researches of J. A. Rapoport have resulted in what the method of the chemical mutagenesis finds application in genetics, cytogenetic, and in the agriculture. This method is used large scientific collectives both in our country and abroad. It also has application in experimental biology, microbiology, agriculture, and medicine. The method of the chemical mutagenesis was used in the selection of agricultural plants, for example were created the cultivars of oat and barley [19]. N. S. Eiges with collaborators created cultivars of winter wheat the Sibirskaja niva (Siberian field), the Stavropolskaja kormovaja (Stavropol fodder), and the Imeni Rapoporta (Name of Rapoport) [20] and perspective specimens.

Collections of researches works of J. A. Rapoport [16, 17], books on his activity [21, 22], and his fundamental theoretical work [23] were published posthumous. These publications were fulfilled with the initiative and the participation of his wife of doctor of biological sciences of O. G. Strojeva. Century of J. A. Rapoport conferences and publications were devoted. Researches with the use of method of chemical mutagenesis continued, in particular in works N. S. Eiges et al. [24], which have large achievements in genetics, selection, and practical application of the winter wheat mutants.

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ПРЕДВИДЕНИЕ И.А. РАПОПОРТОМ ВТОРИЧНОГО МУТАГЕНЕЗА В РЯДУ КЛЕТОЧНЫХ ПОКОЛЕНИЙ

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Механизм химического мутагенеза был открыт, изучен и подтверждён на практике всемирно известным ученым, И. А. Рапопортом. Он обнаружил, что химические вещества — кетоновые соединения, алкилирующие агенты, взаимодействуют с активными группами белков в цитоплазме и хромосомах. Тем самым он предвосхитил явление образования в клетках вторичных мутагенов.

ПЕРЕДБАЧЕННЯ Й.А. РАПОПОРТОМ ВТОРИННОГО МУТАГЕНЕЗУ У НИЗЦІ КЛІТИННИХ ПОКОЛІНЬ

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Механізм хімічного мутагенезу був відкритий, вивчений і підтверджений на практиці всесвітньо відомим вченим, Й. А. Рапопортом. Він виявив, що хімічні речовини — кетонові сполуки, алкілуючі агенти, взаємодіють з активними групами білків у цитоплазмі і хромосомах. Тим самим він передбачив явище утворення в клітинах вторинних мутагенів.