The first alkaloids, theobromine and harmine, were discovered in Russia in the forties of the last century [1]. Then, at the time of the first world war, when Russia was experiencing a shortage of medicaments, the industrial isolation of morphine and codeine from opium, of caffeine from tea dust, of theobromine from cacao pods, etc., was organized, and Prof. A. E. Chichibabin, with his colleagues and pupils, V. M. Rodinov, N. A. Preobrazhenkii, R. A. Konovalova, and others developed a method of obtaining codeine and apomorphine from morphine and other methods. The investigations begun in this period by A. E. Chichibabin and N. A. Preobrazhenskii and their colleagues perfected the synthesis of pilocarpine, cocaine, tropine, scopalamine, arecoline, colchicine, the ipecac alkaloids, yohimbine, cinchonamine, eserine, and the curare alkaloids [2].

In 1928, an alkaloid division in the Ordzhonikidze All Union Chemical and Pharmaceutical Scientific Research Institute (VNKhFI) was organized in Moscow under the direction of Academician A. P. Orekhov. Its workers studied mainly the domestic flora in order to find medicinal substances of practical value in it and to establish the structure of newly-isolated alkaloids.

The first Soviet alkaloid, anabasine, was isolated from the central Asiatic plant Anabasis aphylla by Academician A. P. Orekhov in 1929 [3]. Anabasine has the composition C10H14N2, gives nicotinic acid on oxidation with potassium permanganate, and loses three molecules of water with the formation of ,β-bipyridyl on dehydrogenation with silver acetate and zinc dust. The catalytic hydrogenation of anabasine forms optically active α,β-bipyridyl. Hence, anabasine has the structural formula of β-(α-piperidyl)pyridine [4, 5].

This formula was confirmed by syntheses [6, 7]. This was the first alkaloid, a compound of pyridine with piperidine, that proved to be an effective insecticide, like nicotine.

Subsequently, A. P. Orekhov and G. P. Men'shikov [4] isolated lupinine from the low-boiling fraction of the mixture of alkaloids of Anabasis aphylla, and the new alkaloids aphyline and aphyllidine from the high-boiling fraction. The catalytic hydrogenation of aphyllidine gave aphyline and the electrolytic reduction of aphyllidine gave dextro sparteine. In view of the loss of optical activity of the des-bases in the repeated Hofmann degradation of aphyllidine, Orekhov ingeniously proposed the following structural formulas for these alkaloids [8]:

A. P. Orekhov and R. A. Konovalova [9] isolated from Convolvulus pseudocantabrica two new alkaloids, convolvine and convolamine, which proved to be esters of tropine and nortropine with veratric acid:

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In 1932, G. P. Men’shikov isolated heliotrine $C_{16}H_{27}O_{2}N$ and lasiocarpine $C_{21}H_{33}O_{2}N$ from the central Asiatic plant *Heliotropium lasiocarpum* [10]. The alkaline hydrolysis of heliotrine gave an optically active amino alcohol, heliotridine, and heliotric acid. In heliotridine, the nitrogen is tertiary and the two oxygens are in the form of hydroxyl groups.

Catalytic hydrogenation of heliotrine in the presence of platinum formed a saturated monohydric amino alcohol, hydroxyheliotridane, and heliotric acid. On being heated with concentrated sulfuric acid, the hydroxyheliotridane was dehydrated, forming a base with a double bond, heliotridene, the hydrogenation of which formed the saturated base $C_9H_{12}N$, heliotridane. Consequently, the conversion of heliotrine into heliotridane can be illustrated by the following scheme:

$$\begin{align*}
\text{heliotrine} & \rightarrow \text{heliotric acid} \\
\text{heliotrinic acid} & \rightarrow \text{hydroxyheliotridane} \\
\text{hydroxyheliotridane} & \rightarrow \text{heliotridene} \\
\text{heliotridene} & \rightarrow \text{heliotridane}
\end{align*}$$

Splitting out of trimethylamine from heliotridane after three successive Hofmann degradations shows that the nitrogen of heliotrine is present at the nodal point between two condensed rings.

The Zelinskii dehydrogenation by means of a palladium-asbestos catalyst of dihydro-des-N-methylheliotridine formed a base which proved to be a pyrrole, These reactions showed that one of the rings of heliotridine is a pyrroline ring.

Tetrahydro-des-N-dimethylheliotridane was synthesized. From this work, the structure of 1-methylpyrrolizidine was proposed for heliotridane, and Men’shikov confirmed this by the synthesis of $dl$-heliotridane.

Then, the synthesis of heliotridane was repeated by two other methods and it was possible to obtain both of its diastereomeric forms. Thus, G. P. Men’shikov discovered the existence of the nitrogen heterocyclic compounds of the pyrrolizidine series. At present, more than 120 alkaloids of this series are known. Many of them were isolated from *Senecio* plants by R. A. Konovalova and A. P. Orekhov. Among them platyphylline has proved to be a valuable medicinal substance. With rare exceptions, the alkaloids of the heliotridane group are esters of mono- and dibasic acids and 1-methylpyrrolizidine; they have two asymmetric centers and are therefore derivatives of $l$- and $d$-heliotridane, pseudoheliotridane, and 1-pseudoheliotridane. Men’shikov and Kuzovkov have shown that heliotridine is a diastereomer of retronecine [11].

Heliotrine is nothing other than heliotridane in which the primary alcohol group has been esterified with heliotrinic acid, which explains the reductive decomposition of heliotrine well.