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At the origins of soviet oncology: scientific priorities

Relevance: *The modern state of Russian oncological science is the result of the evolutionary development of oncology in the USSR at various stages. This development is of certain interest for specialists.*

Purpose of the study: *To show the main scientific priorities at the dawn of the development of Soviet oncology.*

Results: *In the first half of the 20th century, biochemical and viral concepts of malignant tumors' etiology were the most popular. The studies on the role and meaning of viruses in the emergence and development of tumors headed by professor L.A. Zilber have used immunological reactions to establish the presence of specific antigens in neoplasms and blood of cancer patients. In blood, they were connected to erythrocytes. A.D. Timofeevsky also supported the viral theory of cancer. At the II Congress of Oncologists of the Ukrainian SSR, he reported finding the virus-like globular formations which he had managed to cultivate. He considered the obtained data as an indirect proof of the viral etiology of human malignant tumors. The conducted studies of the thin structure of malignant tumor proteins have illustrated the abnormalities in protein synthesis at the oncological process. N.N. Petrov has promoted biochemical concept as a more probable and better explaining the observed facts. The discussion between the supporters of the two theories remained lively for many years. The experiments and clinical practice of the Leningrad Institute of Oncology at the USSR Academy of Medical Sciences have evidently proven the blastomogenic properties of chemical and physical agents which still could be considered specific. Harmful agents could become active and blastomogenic through their direct impact from the external environment or as a result of disruption of the normal relations of the organism and the environment.*

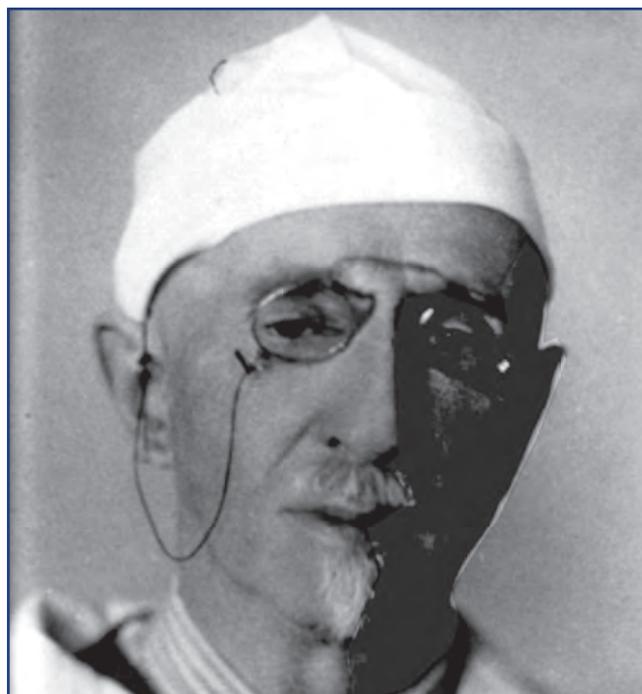
Conclusion: *In the first half of the 20th century, Soviet oncology was deeply studying the main issues of theoretical and applied medicine in general. At that time, surgical disciplines, including oncology, have started the study of pathogenesis and clinical picture of the disease being guided by the doctrine of the academician I.P. Pavlov on the role and meaning of the central nervous system in the life of a living organism.*

Keywords: *Soviet oncology, formation and development of oncology in the USSR, the founders and scientific directions of Soviet oncology.*

Introduction. Currently, solving the problems of oncology remains a medical task of primary importance for healthcare as a whole, and for surgery in particular. A significant portion of all surgical interventions is associated with malignant tumors. And though the tumor etiology is still not established, we are now much closer to the study and understanding of many aspects of this matter. Cancer surgeons have added many famous pages to the history of Soviet medicine in the process of development of the medical scientific thought and practice.

In October 1926, the government of the young Soviet state has supported the suggestion of Nikolay Nikolaevich Petrov, the founder of the Soviet oncology, and decided on the establishment of the Scientific and Practical Institute of Oncology in Leningrad. That historical decision was the first step towards the creation of a large medical center – the future Oncology Research Institute, awarded the Order of the Red Banner of Labor, at the USSR Ministry of Health. Nowadays, this Institute is named after its founder – Professor N.N. Petrov and is officially named as the Federal State Budget Institution “N.N. Petrov National Medical Research Center of Oncology” of the Ministry of Health of the Russian Federation.

N.N. Petrov expected the Institute to become a research center for an interrelated study of etiology, nosogenesis, diagnostics and clinical picture of malignant neoplasms to



Nikolay Nikolaevich Petrov (1876-1964)

ensure a solid scientific basis for the organization of cancer control. The Institute started from three clinical units with 110 beds (two surgical units and one gynecological

unit), a small outpatient clinic, the departments of X-ray diagnostic and X-ray therapy, and the USSR's first laboratory of experimental tumors. In the 1930s, a dispensary department with a diagnostic station was established at the central municipal outpatient clinic to serve the city and the region. Specialized oncology offices were opened in three large municipal polyclinics and large-scale educational activities started.

In 1931, a special office was opened at the Institute for the accounting and analysis of treatment outcome. Its staff collected the reliable information and systematically catalogued 5 year-results of treatment of cancer patients. In 1934, the world's first growth prevention inpatient department was established at the Institute to study precancer diseases, their prevention and treatment methods.

During the next years, the laboratories of experimental morphology and cytology, biochemistry, morbid anatomy, clinical diagnostics as well the world's first department of social oncology were organized at the Institute.

In 1944, during the Great Patriotic War, in spite of all the difficulties of the war time, the Soviet Government has found the opportunity to allocate to the Institute a new territory and a building in one of the picturesque areas of Leningrad, on the Kamenny Island. Soon after the war, another special building was built to host several more laboratories in order to expand modern experimental and theoretical research in the field of nosogenesis, biochemistry, and morphogenesis of malignant growth.

In 1945, the first Soviet laboratory for experimental cancer therapy was organized at the Institute to lay the foundation of the Soviet school of chemotherapy of malignant tumors. In 1947, employees of that laboratory together with the specialists of the Lensovet Technological Institute have synthesized and tested Embihin which appeared to be efficient in treating systemic cancer diseases [1].

The scientific and practical activity of the staff of Cancer Departments at national medical universities has played an important part in the development of Soviet oncology. Let us see the sample of Leningrad cancer school.

The establishment of the Oncology Department at the Leningrad Institute of Advanced Medical Studies is directly connected with the name of Nikolay Nikolaevich Petrov, the founder of Soviet oncology, and his closest followers and colleagues. For many years (from 1913 till 1958), N.N. Petrov headed the Surgery Department at the Leningrad Institute of Advanced Medical Studies. Under his direction, the problems of oncology were dominating in the activity of the Department. N.P. Napalkov rightly pointed out that "The main merit of N.N. Petrov is that he has not only created and substantiated the concept of poly-etiology of malignant tumors but also put maximum efforts to organize a country-wide oncology service

on its basis. N.N. Petrov has not only managed to implement his ideas but has also raised the problem of cancer control to the state level." Already in 1923, N.N. Petrov wrote in one of his articles: "Cancer disease is a public disaster of huge size" and further "... the main basic principle lies in the fact that the practical implementation of cancer control is recognized as a state task in the Soviet Union" [2].

Officially, since its foundation in 1931, the Oncology Department was a subdivision of the Leningrad Institute of Advanced Medical Studies. At the same time, Research Institute of Oncology was and remains the clinic and scientific base of the newly founded department. N.N. Petrov, S.A. Kholdin, and A.I. Rakov were the first leaders of the department, its founders. They worked at the Institute for many decades making a great contribution in the development of Russian oncology [3].

S.A. Kholdin rightly said that "When the Institute has started its activity, the only oncologist there was its founder and organizer Nikolay Nikolaevich Petrov. He was facing a challenge to train the first cohort of oncologists, "the trainers for trainers", and it took the first 5-6 years of the Institute's activity" [3].

N.N. Petrov wrote: "...as for the doctors sent to the advanced courses and specializations, the cycles of medical knowledge should include a course in oncology aimed to [3]:

1. Train the oncologists able to work at large cancer centers.
2. Train the lecturers skilled in oncology for medical departments.
3. Improve skills of specialists working in preventive healthcare centers in the regions."

In conclusion, N.N. Petrov summarized: "The experience of delivering lectures and demonstrations to the surgeons during the first six semesters of short courses in oncology conducted by me at the Leningrad Institute of Oncology has proven the significant interest in these courses and the possibility of practical success of expanding them up to a cycle."

Since 1935, N.N. Petrov has delegated the main duties of teaching at the Department of Oncology to S.A. Kholdin. The Oncology Department was officially legalized only in 1944. The oncological course consisted of 510 hours, of them, 136 hours of oncological lectures and 374 hours of practical studies. At that, 86 lecture hours were dedicated to complementary sciences such as epidemiology, biochemistry, biology, and general pathology [3].

In 1953, S.A. Kholdin left his position at the Oncology Department of the Leningrad Institute of Advanced Medical Studies and focused on his activity at the position of the Head of the 1st Surgery Department at the Institute of Oncology which he occupied from 1927 till the end of his life in 1975 [3]. Semen Abramovich Kholdin was one of the main Soviet oncologists and was widely known

abroad. He was a member of USSR Academy of Medical Sciences and the author of numerous writings dedicating to the development of breast cancer and colorectal cancer treatment methods. Semen Abramovich has made a great scientific contribution and trained many honorable followers who continue his practice till today.

In the first part of the 20th century, biochemical and virus conceptions of cancer growth had prevailed. The studies under the guidance of Prof. L.A. Zilber had proven that in the presence of human cancer the immune reactions revealed specific antigens in the neoplasms and the blood of cancer patients. In blood, those antigens were linked with erythrocytes [4]. A.D. Timofeevsky who also supported a virus theory of cancer reported at the II Congress of Oncologists of the Ukrainian SSR that he had managed to find and incubate virus-like globular formations [5]. Taking into account the serological tests, anaphylaxis and deallergization, the author supposed a specific nature of the incubated virus-like globular formations. The obtained data allowed A.D. Timofeevsky to consider those formations as an indirect proof of the viral etiology of human cancer [5].

However, Professor A.I. Serebrov was not sure about the role of viruses in etiology of tumors. Virus-like bodies found by L.A. Zilber in patients with polyposis gastrica and urinary bladder could hardly be real viruses and not parts of the patients' body [6]. There was not enough evidence to consider tumor antigens as viruses, and not modified proteins of the body. All those issues required further research.

Prof. N.N. Petrov also doubted the role of viruses in the etiology of tumors. In his opinion, tumor growth was a kind of the body reaction to the damage of its tissues leading to a dystrophy occurring locally and in the central nervous system, with a future formation of a cell reproduction site with the finest changes in tissue proteins.



A.D. Timofeevsky (1887-1985)

In March 1957, at a conference in Moscow organized by the Institute of Experimental Pathology and Cancer Therapy of the Academy of Medical Sciences of the USSR together with the Society of Oncologists of Moscow and the Moscow Region, A.D. Timofeevsky reported on the views on viral etiology of human cancer. Sharing his impressions about that conference with the Leningrad Association of Oncologists, N.N. Petrov pointed out that the findings of A.D. Timofeevsky had greatly extended the knowledge about the virus-like bodies in the human tumors which were the composite elements malignant tissues and cells [1, 7]. The issues raised at the conference were at the stage of accumulation of material and no final conclusions could be made. The followers of the viral origin of tumors made no practical proposals that could be applied the prevention of that horrible disease.



L.A. Zilber (1894-1966)



A.I. Serebrov (1895-1980)

In those years, I.B. Zbarsky, K.A. Perevoshchikova, S.R. Mardashev and others were involved in the study of fine structure of proteins of a malignant tumor; certain data was obtained on the violation of protein synthesis during the oncological process. According to R.E. Kavetsky, neoplastic growth was strongly influenced by profound disorders in protein metabolism and general metabolism. The nervous system trophism, the functionality of endocrine glands and connective tissue were declared as the main factors for "cancerous disposition" [1].

N.N. Petrov believed that biochemical conception was more probable and better explained the available observations. Supporters of both theories led a lively discussion for many years.

The experimental and clinical studies conducted at the Leningrad Institute of Oncology at the USSR Academy of Medical Sciences have definitely demonstrated the blastomogenic properties of chemical and physical agents. Still, those properties could not be considered absolutely specific. Harmful agents could become active and blastomogenic at their direct impact from the external environment or as a result of a breach in the normal balance of the body and the environment (Prof. L.M. Shabad) [8, 9].



L.M. Shabad (1902-1982)

Physical and chemical agents were believed to be specific, and that circumstance could be a way to eliminate in advance their harmful impact on the human body.

In the meantime, the methods of rapid determination of carcinogenic substances by their physical properties were developed. For example, fluorescent-spectral methods could be used to detect 3, 4-benzpyrene in a number of mixtures that turned out to be carcinogenic. It was hard to overestimate the significance of those studies for the prevention of occupational and community-acquired cancer.

The importance of clinical and experimental studies should be mentioned that gave a certain idea about the existence of precancer that allowed monitoring the pre-malignant changes in the body. The detection of pre-malignant changes made it possible to timely diagnose the emerging cancer process and take preventive and treatment measures to prevent the progression of cancer. "Each cancer has its own precancer" but not every "precancer" becomes a cancer: the premalignant stage is the most variable stage of the tumor disease," said L.M. Shabad [9].

N.N. Petrov believed that such an approach could bring us closer to solving the problem of cancer. Premalignancy was to be diagnosed only in the presence of clear definite symptoms of malignization.

A.I. Serebrov emphasized the need for a countrywide study of regional features of the spread of tumors [10, 11].

The possibility of studying the geographical features of the spread of cancer was noted in the pre-revolutionary Russian literature. I.e., as early as in 1914, V.S. Levit discussed in his book "On the issue of gastric cancer and its palliative surgical treatment" (Kazan, 1914) [1].

The report made in 1956 A.F. Yastrebov on the use of epidemiological analysis in the study of characteristics of regional spread of cancer deserved a certain attention. The reports of N.G. Znachkovsky, L.N. Korenevsky, and D.M. Yudovich on the regional features of malignant tumors in the Ukrainian SSR and the report of A.V. Chaklin on the role of clinical and statistical method in the study of the regional features of the spread of cancer caused considerable interest. Those reports have partly shed the light on the role and impact of climatic and soil conditions on the occurrence and spread of that terrible disease.

The availability of a wide network of cancer dispensaries in the USSR has allowed a deeper study of the regional features of the spread of malignant tumors and the formation of a clearer view of the geographical dissemination of cancer.

In those years, cancer control in the Soviet Union was managed by the leading cancer research institutions - the Institute of Oncology at the Academy of Medical Sciences of the USSR, P.A. Hertsen State Institute of Oncology, and the Institute of Experimental Pathology and Therapy at the Academy of Medical Sciences of the USSR. The institutes, large laboratories and clinical cancer institutions were established in Kiev, Sverdlovsk, Baku, Tbilisi and a range of other national cities. A wide network of cancer institutions performed sanitary, educational, preventive, therapeutic, and diagnostic activities. In such institutions, doctors of various specialties were fighting together against cancer. The implementation of massive public preventive medical examination allowed preventing certain cancer diseases, timely detect and treat pre-malignant processes.

A lot of attention was paid to the social aspect of cancer control. A high rate of utilization of medical services by the population ensured in some cases an early diagnosis of a developing tumor.

The correctly organized periodic health examination was the surest way to detect tumors early and created the most suitable conditions for preventive measures. According to N.N. Petrov, the current knowledge of the causes of cancer not only allowed but necessitated the preventive fight against this disease.

The Guide on General Oncology of 1958 edited by N.N. Petrov deserved special attention. Its value was evidenced even by its introduction written by N.N. Petrov. It said that the Guide considered "of course, not the individual forms of malignant tumors described in the guides on special cases of oncology but the general properties of all such forms, while determining their place in a number of diverse pathological disorders of normal life, the distribution of nature, causes and mechanisms of their development, recognition, prediction, as well as the basic principles of their treatment and prevention at the present level of our knowledge" [2]. The authors of the Guide intended to present the major views of modern medicine on both more or less firmly established facts and the difficult unresolved, controversial issues of the modern oncology. And they sensationally managed to do it in a succinct format.

Major issues of oncology developed in the USSR were reflected in 11 reports presented by the Soviet delegates at the VII International Anticancer Congress in London in 1958. Soviet doctors worked a lot on the pathogenesis, diagnostics, and treatment of cancer tumors of various organs, widely applied the up-to-date methods of complex treatment (surgical treatment, radiation therapy and combined surgical-radiation therapy) and the methods of hormonal influence on neuroendocrine mechanisms of tumor growth [1].

In the first half of the 20th century, the Soviet oncology was deeply studying the major issues of theoretical and

practical medicine in general. Surgical disciplines, including oncology, were approaching the study of pathogenesis and the whole picture of the disease guided by the teachings of Acad. I.P. Pavlov on the role and importance of the central nervous system in the life of a living organism.

In summary, it should be noted that since the 1930s the Soviet surgeons and oncologists, together with other Soviet scientists have achieved significant results thanks to the contribution of outstanding personalities and purposive professionals. Modern cancer schools inherit the old schools of Russian and Soviet surgery and oncology. Modern oncologists honor and develop the best traditions of the past, the scientific thoughts of their predecessors, trying, in turn, to pass them on to the younger generation of doctors.

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