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1. In 1943, a group of scientists under Doctor of Science Yermoleva, including Levitov, Dorfman, Urazova, and others, began work on penicillin at the Institute of Biological Prophlaxis of Infections, Moscow, Obukha 8. At about the same time, Novoseltseva and Yakimov began research at Leningrad University, and Dr. Nikolai Mikhailovich Borodin began at Baku.

2. With the exception of Borodin, these workers had no knowledge of large-scale fermentation techniques but based their work on techniques used in the production of bacterial vaccines, consisting of growing the mould in meat broth media in Roux flasks.

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3. Yermoleva had little knowledge of [redacted] manufacturing methods and knew nothing of the difficulties which had been encountered and overcome [redacted] She told the Soviet authorities that the problem was quite a simple one and that she would have no difficulty in producing Soviet penicillin.

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4. She began by testing various species of Penicillium found in the USSR and finally found a strain which appeared to have satisfactory antibiotic-producing properties. This organism was sent, for identification, to the mycologist Kursanov in Moscow. Kursanov turned it over to one of his junior assistants, who, on insufficient grounds, identified it as Penicillium crustosum.

5. This finding was welcomed by all concerned as being additional evidence of the purely Soviet nature of the discovery of penicillin. Borodin, however, later took some of the alleged P. crustosum to [redacted] where it was examined [redacted] and found to be P. notatum, i.e., the same species as originally used [redacted] 50X1-HUM

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6. The group continued to produce small quantities of impure penicillin by surface culture methods, on a meat broth culture medium, and in 1944 delivered a supply to Academician Burdenko of the Academy of Medical Sciences for testing on patients. The results were very good, the group was appropriately rewarded, and the production of Soviet penicillin was entrusted to their scientific supervision.

7. [redacted] however, [redacted] the penicillin tested by Burdenko was [redacted] penicillin, transferred to new ampoules and given a new label by the Yermoleva group. 50X1-HUM

8. The group, being under the impression that meat broth was essential for the culture of Penicillium, approached Minister of Meat and Dairy Industry Pavel Vasiliyevich Smirnov as the chief source of waste animal products for the preparation of broth. Smirnov, in the autumn of 1944, called a meeting of experts in Moscow to organize penicillin production, and it was decided to begin experimental production in a building belonging to the Mikoyan Meat Combine in Moscow, with a scheduled output of 3,000 mega units per month.

9. The supply difficulties were, however, much greater than anticipated. The plant was not yet functioning in January 1945, when the Kremlin telephoned, ordering a supply of Soviet penicillin. This order could not, of course, be met, and Smirnov was admonished by Malenkov for his failure to organize production according to plan. ([redacted] Comment: This incident was [redacted] to have occurred about February 1946 but the above date is believed to be more nearly correct.) 50X1-HUM

10. By the spring of 1945, a production rate of 1,500 mega units per month had been achieved--in solution only, however, as the freeze-drying installation necessary to produce penicillin in powder form was not available. Because this output was inadequate, the Ministry started a second surface culture plant in the Leningrad Meat Combine, under the scientific direction of the Yermoleva research group, which continued to furnish erroneous directions. Small-scale research was started also at the Soviet Army Sanitary-Hygienic Research Institute at Kuibyshev, under Col. N. N. Ginsburg.

11. Minister P. V. Smirnov, realizing that his production plan could not be fulfilled, asked Col. Gen. Efim Ivanovich Smirnov, CG of the SAMC, for assistance, and Col. Ginsburg and his team were sent to Moscow to assist the Mikoyan Meat Combine in overcoming its production difficulties. The new experts had no experience in mycology and therefore could give no assistance in fermentation problems. However, they devised a very primitive extractor and an incredibly inefficient freeze-drying installation, both of which bear eloquent witness to the technological ignorance of both the Mikoyan Meat Combine and the Kuibyshev experts. 3,000 1,000,000 50X1-HUM

12. By the middle of 1945, a total output of 3,000 mega units had been reached. Minister Smirnov then called Borodin from Baku and ordered him to [redacted] acquire knowledge of [redacted] penicillin production techniques. Borodin was instructed to say nothing of Russian production, except that it differed in no way [redacted] 50X1-HUM

13. Borodin found that, although there were still some surface culture plants [redacted] even these were immeasurably superior to anything possessed by the Soviets. Even the [redacted] factory, using obsolete methods and equipment, is still far in advance of Soviet practice. 50X1-HUM

14. Borodin reported in 1946 to Minister Smirnov and to Mikoyan, saying that the situation was that there was no one in the USSR with any real knowledge of penicillin research and production and that the only solution was to buy plant and technical knowledge [redacted] which he offered to do. No reply was received by him regarding this proposal. He also wrote a number of reports covering most of the stages of penicillin production and bought all available publications on the subject (300 copies of each), which he despatched to the Soviet Union. 50X1-HUM

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15. No reply to any of his reports was ever received, but at the end of 1946 Borodin was recalled to Moscow, arriving in January 1947. He had heard during the summer of 1946 that P. V. Smirnov had been dismissed and that a Ministry of Medical Industry had been created, which would control penicillin production. Former RSFSR Minister of Health Tretyakov was now in charge of production, as Minister of Medical Industry. The Deputy Minister was Natradze.

16. Very little progress had been made during Borodin's absence. The Academy of Sciences of the USSR was now concerned through the person of Prof. Imshenetsky (previously reported as Imshanetsky), of the Microbiological Institute, with four assistants; and an Antibiotics Committee, under Chairman Academician Orbeli and Deputy Chairman Academician Oparin, had been established. The Leningrad group, under Yakimov, and the Yermoleva group functioned as before. On the production side, there were now four plants, all using the surface culture method, in operation:

a. Mikoyan Meat Combine plant, Moscow: Monthly output 4,000 mega units. Experimental work on submerged culture was beginning here, with a tank of 10 cu. m. capacity.

b. Factory No. 40, Moscow, Lesnaya Ul.: Output 2,500 mega units monthly. This is a small factory, previously used for aspirin production. One room was allocated to surface culture and one to extraction (Sharples centrifuge).

c. Karpov chemical-pharmaceutical plant, Nizhne Kotly, near Moscow: Output 1,000 m.u. monthly. Penicillin production occupied four small rooms.

d. Leningrad, in a former sausage factory: Output 3,500 m.u. monthly.

Total monthly output, January 1947: 11,000 m. u.

17. Borodin attended a meeting of the Antibiotics Committee in January 1947, soon after his return to the USSR. All agreed that the production position was very unsatisfactory and ascribed this to supply difficulties. They considered that the only hope was to find a sufficiently powerful sponsor in the Politburo. Orbeli, who was chairman, impressed on those present the importance of research. Imshenetsky and others reported the results of minor research in which they had been engaged. Priorov (a surgeon, Deputy Minister of Health) read a paper, and Borodin reported on his foreign experiences. Katkovsky, of the Ministry of Meat and Dairy Industry, and Kalinichenko, manager of the experimental factory of the Mikoyan Meat Combine, also spoke. The campaign against admiration of foreign science had just begun; and, perhaps for this reason, an announcement by Moisei Isakovich Ioffe, a Leningrad biochemist, to the effect that he intended to synthesize penicillin, was received with less skepticism than it deserved.

18. Borodin decided to visit Mikoyan, of the Politburo, whom he knew personally. Mikoyan was in charge of the group of ministries concerned with production, to which the Ministry of Meat and Dairy Industry belonged, and Borodin had had dealings with him in connection with the manufacture of gland products in the Baku Meat Combine. Borodin reported on the state of penicillin research and production in the USSR [redacted] and explained how much the latter was in advance of the Soviet Union. Mikoyan agreed with his views, but said: "You must not forget that the resources of our country are not unlimited." 50X1-HUM

19. Mikoyan then told Borodin of the projected future organization of penicillin production, whereby it would cease to belong to the Ministry of Meat and Dairy Industry, of which Mikoyan was sponsor, but would be transferred to the new Ministry of Medical Industry, under Tretyakov (sponsors in Politburo: Voroshilov, later Saburov). [redacted] Comment: Saburov is not believed ever to have been a member of the Politburo; but, as Deputy Chairman of the State Planning Commission, he may have been asked to submit recommendations to the Politburo.) Plant was to be purchased [redacted] for a monthly output of 80,000 m. u. The Central Committee of the Party had recommended to 50X1-HUM 50X1-HUM

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Kuzmennikh, who by now was Minister of Meat and Dairy Industry, that Borodin be transferred to the new Ministry of Medical Industry and had designated him as head of the projected All-Union Scientific Research Institute for Penicillin and Other Antibiotics. Borodin was to take over his new duties immediately, without even returning to Baku to complete his personal, scientific, and Party affairs.

20. [redacted] these decisions, in particular Mikoyan's relinquishment of sponsorship of penicillin production, were almost certainly dictated by Mikoyan's political astuteness, i.e., his desire not to be associated with or responsible for what was evidently a risky proposition, likely to compromise those directly concerned. For a minister is held responsible for fulfilling the production quota imposed on him, although, except in the case of defense ministries, he can never rely on actually receiving the supplies from other ministries essential for this purpose. A new ministry is in a peculiarly unfavorable position, in that it has to compete for its supply quotas with older established ministries, which have, in various ways, assured their supply channels. For this purpose, it is essential to establish a network of personal contacts who will, in return for bribes or services, make available supplies from concealed stocks or divert supplies from other customers, and this requires much time and finesse. 50X1-HUM

21. Borodin then reported to Tretyakov, who welcomed him cordially with the words: "You have gained experience [redacted] which you can now put into practice." The Minister said that Stalin had already approved the project for the establishment in Dzaudzhikau (ex-Ordzhonikidze) of a new plant with a monthly output of 80,000 m.u. and that the two UNRRA plants in Kiev and Minsk were to come under him, as well as the already existing plants in Moscow and Leningrad. However, the draft charter of the new Ministry of Medical Industry providing for these transfers had been returned for revision by Kosygin (secretary to Politburo), and Borodin's first job would be to assist in producing an acceptable draft. 50X1-HUM

22. The penicillin-producing resources of the new ministry would be as follows:

a. UNRRA plant in Kiev:	output	15,000	m. u.	monthly.
b. UNRRA plant in Minsk:	"	15,000	"	"
c. New plant in Dzaudzhikau (in the Gigant Works):	"	80,000	"	"
d. Factory No. 40 in Moscow:	"	20,000	"	"
e. Factory No. 7 in Moscow (in a former machine shop):	"	15,000	"	"
f. Plant in Sverdlovsk (in the Microbiological Institute):	"	5,000	"	"
g. Plant in Riga (in the Pharmakon Factory):	"	10,000	"	"
Total monthly output:		160,000 m.u. monthly		

23. However, not all of these establishments were in production, or even in existence. For example, the Dzaudzhikau plant was to begin production six months after delivery of the plant from foreign supplies, and others were scheduled to begin at various times during 1948. The more primitive of the existing plants were to be closed after the new ones had begun.

24. Borodin raised various objections to this program:

a. The proposed total output was far too small.

b. The principle of having small, widely dispersed production units was wrong, not only because of the necessarily primitive equipment of small plants and of their wasteful use of manpower but also because the available skilled personnel was in very short supply and was inadequate to staff that many establishments.

c. The buildings allocated for housing the plants were in most cases unsuitable for the purpose.

d. Most of the plants, including the two UNRRA plants, were so antiquated and inefficient as not to be worth running.

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the staff employed to run the plant in Factory No. 40, scheduled to produce 20,000 m.u. monthly, was 300, 50X1-HUM The staff of the Mikoyan Meat Combine experimental factory (output 5,000 m.u. monthly) was at that time 350 strong.

25. Tretyakov received these criticisms sympathetically but said that it was too late to make any major changes. The production program approved by Stalin in May 1947 accordingly envisaged a total output of 500,000 m.u. per annum by 1950.

26. On the research side, the All-Union Scientific Research Institute for Penicillin and Other Antibiotics (VNIIP) was created, with Borodin as director. The staff was to be 400 strong, with four locations in Moscow, as follows:

a. Main establishment: Obukha Ul. 8, in the accommodation previously belonging to the Institute of Bioligical Prophylaxis, which was abolished as a separate unit and was incorporated into the new institute. This establishment has the following departments:

Chemistry
Assay
New antibiotics
Biotherapy
Technology
Certain administrative offices

b. Accommodation in the All-Union Scientific Research Institute of Chemical-Pharmaceutical Industry (VNIIKhFP), for the study of metabolism of moulds and selection of strains.

c. Department of Experimental Technology, in Factory No. 40.

d. A small streptomycin research department in the Karpov plant, Nizhne Kotly, near Moscow.

27. The research problem was very difficult. There was an acute shortage of qualified research staff, and the pay of junior research workers was much less than they could obtain in industry or certain branches of public health. For this reason, very few scientists stayed longer than was required to become semi-proficient in some specialized branch of microbiology or mycology, and the available research staff consisted of third- or four-class scientists. Scientific literature was in very short supply, and many non-Soviet periodicals were inaccessible to the workers. Because of exaggerated security regulations, much of the work done in the USSR was never published; but even published work was not readily available to all workers. Foreign textbooks and monographs were even more inaccessible than periodicals. Laboratory glassware, even such elementary items as Petrie dishes and test tubes of uniform size, was very difficult to obtain. All reagents were in short supply, and very pure ones were practically unprocurable.

28. Another circumstance which held up work was the delusion prevalent in Academy and Ministry circles that penicillin could be synthesized on a commercial scale, on the grounds that Soviet chemists must be better than foreign ones and therefore should succeed where others had failed. The chemists who had airily undertaken to fulfill this project were, however, ignorant of foreign work done on this problem and, moreover, had to work under far worse conditions [redacted] Because of shortage or lack of reagents and fine chemicals, they had to devote half of their time to the production of intermediates which a [redacted] chemist would order from dealers. Finally, Soviet chemical laboratory glassware and equipment are archaic, corresponding to those used in [redacted] laboratories about 25 years ago; thus, standard interchangeable all-glass apparatus is still unknown. This diversion of effort to the illusory synthetic penicillin project was an additional factor impeding the proper development of Tretyakov's plan. 50X1-HUM 50X1-HUM 50X1-HUM

29. It soon became evident that the industrial development of even the small plants envisaged in Tretyakov's plan would be very problematical in view of increasing supply difficulties; and Tretyakov saw that he would be left with his production obligations but without the means of fulfilling them.

30. Under these circumstances, Tretyakov decided that first priority must be given to the purchase of the new 80,000 m.u. plant and of research equipment. He instructed Borodin to proceed without delay [redacted] with two assistants, Leonid Mikhailovich Utkin and Vil Iosifovich Zeifman. The party left the Soviet Union in the summer of 1947. 50X1-HUM

31. By that time (April-May 1947), Tretyakov's position was becoming shaky. Tretyakov was known to have approved of Prof. Varga's economic theories, which in May were denounced as being deviationist. [redacted] a general purge in the Ministry of Health, by the notorious Roskin-Kluyeva trial, and by the unleashing of the anti-foreign campaign in science. Moreover, the Ministry of Medical Industry was a top-heavy organization, with a staff of 2,000, whereas it controlled only a small number of factories, of which the largest (at Nizhne Kotly) was only one-tenth the size of the Burroughs Wellcome Factory [redacted] This worked out roughly at the rate of one bureaucrat for every industrial worker. 50X1-HUM 50X1-HUM

32. Engineer V. A. Chernyavsky, Borodin's assistant, reported that none of the new plants would be in operation by May 1948. [redacted] the Minsk, Kiev, and new Moscow plants still were not in production). 50X1-HUM

33. [redacted] Borodin and his party established contact with about 20 firms and found that no one firm could supply a complete penicillin plant. They reported this to the Ministry and sent lists of equipment and machinery, with a request for instructions as to which items they should order and which could be supplied from Soviet sources. No reply was received to this request, probably because the Minister was reluctant to take the responsibility of deciding to purchase [redacted] equipment which could readily be produced in the USSR but also was afraid not to order it, in case the Soviet supply system failed him. 50X1-HUM 50X1-HUM

34. Meanwhile, Borodin negotiated, [redacted] and sent reports and repeated requests for guidance, without response, until in December 1947 he was ordered by Tretyakov and Mikoyan to drop all negotiations [redacted] 50X1-HUM 50X1-HUM

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35. [redacted]

36. In February 1948, Engr. Chernyavsky [redacted] told Borodin that Minister Tretyakov's position was now very shaky indeed and that Deputy Minister Natradze had been dismissed and replaced by a certain Ostapchuk, a newcomer to the Ministry. (Natradze was then in rapid succession downgraded to the posts of plant manager, section manager, and scientific worker in VNIKhFP.) Soon after, Borodin learned that Tretyakov had been dismissed, that his ministry had been abolished, and that its functions had been taken over by the Ministry of Health, as of April 1948.

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37. [redacted]

38.

39.

[redacted] COMMENT

40. Conclusions:

a. In view of the importance of penicillin supply in both war and peace, it is assumed that Soviet economy must be working under conditions of extreme strain, with only marginal disposable resources of raw materials and intermediates.

b. Penicillin is in short supply in the Soviet Union.

c. The planned future production of penicillin is on an utterly inadequate scale. [redacted]

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d. The limitations imposed are due to:

1) Inability to compete with the defense ministries for supplies of building materials, machinery and plant, basic products, and intermediates.

2) Shortage of competent scientific and technical staff.

e. Bureaucracy and corruption are an essential part of Soviet industrial production, and are becoming increasingly more evident in Soviet applied and pure science.

f. The biological sciences have suffered possibly more than others from the system of purges and terror applied by the Party. The anti-foreign campaign now in progress is likely to complete the process of emasculation of Soviet biology.

g. The Soviet fermentation industry is backward, using antiquated methods and plant. The establishment of a properly constituted penicillin industry would have permitted the training of personnel in methods similar in many respects to those of biological warfare agent production and would have assured the supply of an essential drug. It might, therefore, be supposed either:

1) That the Soviet Union is at present incapable of producing BW agents on the scale necessary for military use, or

2) That all available resources are being put into a BW project, to the virtual exclusion of other projects competing for the same classes of basic materials and personnel.

[redacted] 50X1-HUM