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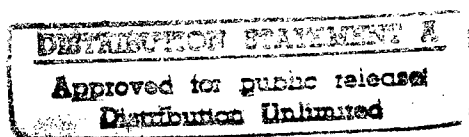
3 April 1961

CONFERENCE ON THE SYSTEMATIZATION OF ACTINOMYCETES,
ANTIBIOTIC PRODUCERS

-USSR-

By V. D. Kuznetsov

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19980122 193

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JPRS: 4502

CSO: 1526-S

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[Following is the translation of an article by V. D. Kuznetsov in Antibiotiki, Vol V, No 6, Moscow, 1960, pages 114-116.]

A conference was held in Moscow 8-10 June 1960 on the systematization of actinomycetes, producers of antibiotic substances, which was convoked at the initiative of the Institute of Microbiology of the Academy of Sciences USSR. The main task of the conference was the discussion of the present state of the systematization of actinomycetes and the elaboration of a unified scheme for the description of new species. Participating in the work of the conference were representatives of the scientific-research institutes of the Academy of Sciences USSR, the Academy of Medical Sciences USSR, VASKhNIL (All-Union Academy of Agricultural Sciences), the Academies of Sciences of the Union Republics, the State Universities, branch institutes, and industrial enterprises.

The conference was opened by the Director of the Institute of Microbiology of the Academy of Sciences USSR, A. A. Imshenetskiy, who noted the timeliness of convoking the present conference and the urgency of the questions to be discussed.

In his opening address, N. A. Krasil'nikov (Institute of Microbiology of the Academy of Sciences, USSR) emphasized the necessity of a wide discussion of the questions relating to the systematization of actinomycetes at the first such conference convoked in the USSR, and also noted the somewhat unusual form of conducting the present conference. For the sake of saving time, the 13 papers presented at the conference were printed in advance on mimeograph machine and mailed to the participants in the conference, who were thus able to acquaint themselves in detail with this material and prepare their talks. Thus, the conference was devoted entirely to a discussion of the questions touched upon in the papers.

The participants in the conference discussed in detail the taxonomic value of the various characteristics used in systematizing actinomycetes.

Morphologic Properties. N. A. Krasil'nikov (Institute of Microbiology of the Academy of Sciences USSR) in his papers "On the Principles of the Classification of Actinomycetes" and "On the Rules of the Classification of Actinomycetes" emphasized that, owing to the widespread search for producers of new antibiotics, the systematization of actinomycetes has assumed great practical significance. Nevertheless, the theoretical bases of classification have as yet been poorly worked out. The description of new species is being done without a sufficiently careful study of the published materials and without comparing them with the data on standard cultures. In studying taxonomic properties, various investigators employ unlike nutrient media and base their differentiation of species on entirely different biologic characteristics. All this introduces confusion into the systematization of actinomycetes and greatly impedes their identification, which reduces to a considerable extent the efficiency of the search for producers of new antibiotics.

N. A. Krasil'nikov gave a detailed critical analysis of the individual characteristics used in differentiating actinomycetes and pointed out that not one of the taxonomic characteristics could serve as a basis for differentiating a species. Only from the entirety of the characteristics is it possible to delimit the species, taking into account, where possible, the phylogenetic relations between the organisms studied. The morphology of the reproductive organs and the vegetative mycelium must be regarded as the leading taxonomic characteristics. The speaker proposed a scheme for describing new species of actinomycetes, in which, alongside of the external characteristics, great significance is also attached to biochemical indices.

In a paper "On the Diagnostic significance of Various Characteristics for the Classification of the Representatives of the Genus Actinomyces," T. P. Preobrazhenskaya, Ye. S. Kudrina, M. A. Sveshnikova and T. S. Maksimova (Institute for the Search for New Antibiotics of the Academy of Medical Sciences USSR) attached prime importance to such a diagnostic feature as the coloring of the spore-bearing mycelium and assigned second place in significance to morphologic features, considering that the first criterion is more stable than the second.

However, both in the paper by Ye. I. Andrenyuk (Institute of Microbiology of the Academy of Sciences Ukrainian SSR), "The Significance of morphologic Characteristics in the Systematization of Actinomycetes," and in the numerous comments by participants in the conference -- Yuan Chieh-shen, A. I. Korenyako, N. I. Nikitina, O. I. Artamonova (Institute of Microbiology of the Academy of Sciences USSR), A. V. Markovich, P. N. Golyakov (Leningrad Scientific-Research Institute of Antibiotics), Yu. K. Kondratenko (Institute of Epidemiology and Microbiology imeni N. F.

Gamalei), O. I. Bershova (Institute of Microbiology of the Academy of Sciences Ukrainian SSR), it was shown on the basis of a large amount of diversified experimental material that morphologic features are the most stable and must be given first place with respect to their importance for the systematization of actinomycetes.

Alongside of the morphology of the sporophores, use must be made of the morphology of the spores and the structure of the spore coat of the actinomycetes in systematizing them. T. S. Maksimova, T. P. Preobrazhenskaya, Ye. S. Kudrina and M. A. Sveshnikova (Institute for the Search for New Antibiotics,) in a paper, "The Use of the Electronic Microscopy of Spores in the Systematization of Actinomycetes," draw the conclusion that the structure of the spore coat is not of diagnostic significance for all groups of actinomycetes. But for actinomycetes forming a gray bluish-green or bluish aerial mycelium, the character of the surface of the spores is an important taxonomic feature. However, the work of N. I. Nikitina and Kh. Lesheval'ye [Lechevalie ?] (Institute of Microbiology of the Academy of Sciences USSR) has shown that this feature is of taxonomic significance for groups, but not for species.

Cultural characteristics. The proposition of T. P. Preobrazhenskaya and others (Institute for the Search for New Antibiotics), regarding the primordial importance of the coloring of the aerial mycelium for the systematization of actinomycetes met with serious objections on the part of S. Yegorova, N. I. Nikitina (Institute of Microbiology of the Academy of Sciences USSR) and others who spoke in the debates. For example, S. A. Yegorova demonstrated the possibility of obtaining colorless forms from *Act. violaceus* and *Act. coelicolor*, which stably transmit this property by heredity. N. I. Nikitina gave the results of treatment of 25 strains of an international collection of actinomycetes, the study of which was organized by the Subcommittee on Actinomycetes of the International Taxonomic Committee. All the investigations were conducted according to a unified method and a unified program. Various laboratories in 15 countries of the world took part in this experiment. Elaboration of the results showed both the great variability of the coloring of the mycelium of actinomycetes and the fact that the description of the color is subjective in character. For example, in the description of the coloring of the aerial mycelium of one and the same strain (No. 10), it was recognized as white in 35 cases, as pink in 36, as brown or cinnamon-colored in 31, as red in 7, as orange in 6 and as yellow in 2. In the description of the color of the substratum mycelium of the same strain, its coloring was recognized as colorless in 28 cases, as white in 21, as violet in one, as gray in 8, as brown in 28, etc.

Physiologic Characteristics. V. D. Kuznetsov, N. M. Lyagina and Ye. I. Sorokina (All-Union Scientific-Research Institute of Antibiotics), in a paper "On Physiological Properties as a Taxonomic Feature in the Systematization of Actinomycetes," on the basis of many years' study of the physiological properties of one and the same strains, come to the conclusion that, owing to their instability, physiological properties are not very valuable taxonomic features. A similar conclusion was drawn by M. A. Sveshnikova, Ye. S. Kudrina, T. S. Maksimova and T. P. Preobrazhenskaya (Institute for the Search for New Antibiotics) in a paper "The stability of Physiological Features and Their significance for the Systematization of Actinomycetes."

O. I. Bershova (Institute of Microbiology of the Academy of Sciences, Ukrainian SSR), in her remarks, expressed the opinion that it was necessary in certain cases to determine the quantitative indices of the fermentative activity of actinomycetes.

Specificity of Antagonism and the Antimicrobial Spectrum.

These indices, as noted by the commentators Yuan chieh-shen, O. I. Artamonova, A. I. Korenyako, Ya. I. Rautenshteyn (Institute of Microbiology of the Academy of Sciences USSR), P. N. Golyakov, V. A. Tsyganov (Leningrad Scientific-Research Institute of Antibiotics), G. F. Gauze, M. A. Sveshnikova (Institute for the Search for New Antibiotics) and N. F. Solov'yeva (All-Union Scientific-Research Institute of Antibiotics), should be used alongside of other taxonomic features in the systematization of actinomycetes. The specificity of antagonism, as a species feature, can be employed only for subdivisions of cultures within groups of externally similar actinomycetes. Since, in studying mutual antagonism, one may encounter the phenomenon of "self-depression" (especially in pigmented cultures), caused by the presence of "necrohormones" or actinophages, it is necessary to make skillful use of this method.

Actinophagy. Ya. I. Rautenshteyn (Institute of Microbiology of the Academy of Sciences USSR), in a paper "On the Use of Actinophages in Identifying Actinomycetes," summed up the bibliographic and his own data testifying to the fact that specific actinophages, possessing a definite spectrum of lytic action, can be successfully used in differentiating individual species of actinomycetes.

V. D. Kuznetsov (All-Union Scientific-Research Institute of Antibiotics), and E. S. Khavina (Institute of Microbiology of the Academy of Sciences USSR), in their comments, cited numerous examples of the advisability of using actinophages in identifying and re-determining actinomycetes. The opinion was expressed that it was necessary to organize a museum of specific actinophages,

whose task would include the supplying of actinophages to the scientific-research institutes.

Serum Diagnosis. As is known, the method of serologic diagnosis is widely used in medical microbiology; it consists principally in high specificity. In a paper "The Significance of Immunobiologic Reactions in the Identification of Actinomycetes," N. K. Solov'yeva and I. D. Delova (All-Union Scientific-Research Institute of Antibiotics) reported on the results of the use of the agglutination reaction in differentiating actinomycetes.

Speaking in the debates, V. D. Kuznetsov (All-Union Scientific-Research Institute of Antibiotics), G. K. Skryabin (Institute of Microbiology of the Academy of Sciences USSR), G. F. Gauze (Institute for the Search for New Antibiotics of the Academy of Medical Sciences USSR) and V. P. Tul'chinskaya (Odessa State University) pointed out the absence from this paper of data on the antigenic structure of actinomycetes, without which work on serum diagnosis loses its meaning, and also indicated the imperfectness of the methods of conducting the experiments, which prevented the authors of the paper from differentiating externally similar species of actinomycetes, i.e. from bringing out the main value of the serologic method, its specificity.

Use of the Method of Antibiotic Chromatography to Differentiate Actinomycetes. To this question was devoted a paper by A. I. Korenyako, N. F. Kirillova and N. I. Nikitina (Institute of Microbiology of the Academy of Sciences USSR) "On the Use of the Method of Paper Chromatography in the Systematization of Actinomycetes," as well as remarks by V. A. Tsyganov (Leningrad Scientific-Research Institute of Antibiotics), who showed on the basis of much experimental material that this method can be used in systematizing actinomycetes, but requires a careful analysis of the results and caution in their evaluation.

Composition of Nutrient Media for the Study of Taxonomic Characteristics. In a paper, "Comparative Evaluation of Various Nutrient Media to Ascertain the Morphologic and Cultural Characteristics of Actinomycetes," Ye. S. Kudrina, T. P. Preobrazhenskaya, M. A. Sveshnikova and T. S. Maksimova (Institute for the Search for New Antibiotics) gave the results of a selection of the optimal media for the growth of actinomycetes. The authors believe that the most favorable nutrient media for the formation of aerial and substratum mycelium are: mineral medium No. 1 (F. G. Gauze), CP-1 with glucose (N. A. Krasil'nikov), oat medium and organic medium No. 2 (G. F. Gauze). The least favorable medium, in the opinion of the authors of the paper, is glucose-asparagin agar.

Ya. I. Rautenshteyn (Institute of Microbiology of the Academy of Sciences USSR) and V. A. Tsyganov (Leningrad Scientific-Research Institute of Antibiotics), in their remarks, noted the importance of standardizing the nutrient media for a description of the taxonomic properties of actinomycetes. In this connection, a proposal was introduced to create a special commission to compile and publish a list of obligatory media to be used in the taxonomic study of actinomycetes.

Variability as a Means of Determining Species. It is known that only on the basis of a profound knowledge of the degree and limits of the variability of this or that species of actinomycete can one avoid errors in describing cultures newly discovered in nature. S. M. Rudaya (All-Union Scientific-Research Institute of Antibiotics), in her comments, cited an example of synonymy in the naming of the producer of oxytetracyclin, resulting from the lack of data on the variability of this species among researchers, who have given new names to different variants of *Act. rimosus*.

A paper by A. A. Prokof'yeva-Bel'govskaya and Z. B. Shamina (Institute of Biophysics of the Academy of Sciences USSR), "Formation of Colonies as a Species Characteristic of Actinomycetes," undertook to use, for diagnostic purposes, such a feature as the character of the change in the microscopic morphology of colonies of actinomycetes in the process of their growth on agarized media through the study of microscopic sections of colonies of different ages. As remarked by N. A. Krasil'nikov (Institute of Microbiology of the Academy of Sciences USSR) and V. A. Tsyganov (Leningrad Scientific-Research Institute of Antibiotics), the insufficient quantity of experimental material does not as yet make it possible to use this feature in systematizing actinomycetes, but the work in this direction presents great interest and deserves encouragement.

S. I. Alikhanyan, L. N. Borisova and L. I. Yerokhina (All-Union Scientific-Research Institute of Antibiotics), in a paper "The Systematization of Actinomycetes in the Light of Our Present Information About Their Genetics," attempted to create new approaches in the systematization of actinomycetes, based on the criterion of the interbreedability of cultures of actinomycetes.

Participants in the debates remarked about the timeliness and great usefulness of the first conference on the systematization of actinomycetes to be convoked in the USSR.

The conference considered it advisable to conduct further research in the hybridization of actinomycetes, the employment of actinophages and the detailed elaboration of serologic methods for the purpose of using the data obtained in the systematization of actinomycetes.

The conference's resolution was published in Antibiotiki, No 5, 1960.