

THE SYSTEMATIC SYSTEM OF P. PESTIS STRAINS ISOLATED IN ARMENIA IN 1962

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THE SYSTEMATIC SYSTEM OF P. PESTIS STRAINS ISOLATED IN ARMENIA IN 1962

Following is the translation of an article by R. S. Mikhaylova, Scientific-Research Antiplague Institute for the Kavkaz and Zakavkaz, published in the Russian-language periodical Trudy Armyanskoy Protivochumnoy Stantsii (Trudy of the Armenian Antiplague Station), No 3, 1964, pages 51--56. Translation performed by Sp/7 Charles T. Ostertag, Jr.

Cultures of the plague microbe, isolated during an epizootic in 1962 in the southeastern part of Armenia, based on their properties * generally turned out to be very close to the strains of P. pestis which were isolated in the Armenian SSR in 1958--1959, and also to the strains which were isolated in recent years from several species of voles and pikas in the Mongolian People's Republic and Zabaykal (Kovaleva, 1958; Shamova, 1959; Vasyukhina and Shchekunova, 1961; Levi et al., 1960, 1961; Shekhiyan, Zilfyan and Sukiasyan, 1961; Kanatov, 1962, and others). Characteristic peculiarities of all of these strains, apart from ecological community, are the capability in early periods to ferment rhamnose and a lowering of virulence, and even avirulence, for guinea pigs. In a significant manner the stated properties go beyond the limits of those criteria which characterize the plague causative agent in its classical form. Apparently for this reason each investigator, when isolating similar cultures, considered it necessary to differentiate the latter in detail from the causative agent of pseudotuberculosis of rodents and to turn special attention to a confirmation of their plague nature. Thus, R. V. Kovaleva (1958) regarded strains, isolated by her from voles in Mongolia, to P. pestis on the basis of their immobility, lack of urease, and pathogenicity for white rats. M. I. Levi (1962) established the presence in vole strains of fraction 1 which is characteristic for the plague microbe.

Footnote 1. * A detailed microbiological analysis of the stated strains are presented in the article by A. A. Vartanyan, R. S. Mikhaylova, M. L. Sukiasyan, and M. T. Shekhiyan, "Concerning the Main Properties of P. pestis Strains, Isolated in 1962 on the Territory of Armenia," which is found in this issue.

In supplementing this, we consider it necessary to stress that during the period of the described epizootic the causative agent was isolated only in the rough form, without the signs of dissociation, and the data of epizootological observations pointed to the leading significance in the transmissive route of transmitting the infection (infected fleas). Also of significant importance is the fact that in guinea pigs

the stated strains form a sufficiently intense immunity to P. pestis in its typical form.

In our opinion the above described microbiological tests and epizootological data testify with sufficient conclusiveness the affiliation of all the cultures examined to the species of P. pestis. Naturally this conclusion does not exhaust the problem concerning the systematic position and nomenclature of this group of strains, since their place within the species is not determined.

M. I. Levi, et al. (1960, 1961, 1962) separate all the similar strains into an independent "vole" variety of the plague microbe. The authors came to the conclusion that "certain species of voles play the role of the main carrier of the plague causative agent and under favorable conditions are capable of supporting its multiplication and development in a countless number of generations."

We feel it possible to agree only with the position that the strains being examined may exist for a long time in populations of voles, pikas, and possibly other rodents. As regards the systematic position of this group of strains, then, in our opinion the classification of M. I. Levi cannot be accepted basically.

The fact is that the marmot, suslik and the rat varieties of the plague microbe, which are ecological races and differ somewhat from each other in features which are minor and unimportant from the point of view of species identification, possess the entire aggregate of properties which are taxonomic for the plague causative agent. Besides this, the features which are differential for vole strains are primarily those features which, according to existing concepts, are not inherent to the species of P. pestis.

In connection with this, the systematization of vole strains on the level of the above enumerated varieties cannot be accepted as correct. It should be pointed out that a doubtless error would be the organization of the problem concerning the revision of the importance of the guinea pig as the main test animal for the plague causative agent. All the experience of work connected both with the study of the causative agent as well as with problems of immunology, pathogenesis and treatment of plague, points to the fact that the guinea pig is the best laboratory model. Many scientists consider that the cellular reactions of the guinea pig to the introduction of infecting agents stand closest of all to the reactions of the human organism.

It is necessary to also take note of the circumstance that the strains of P. pestis, isolated in 1962 in the Armenian SSR, possess certain unstable properties and, according to the terminology of Ye. I.

Korobkova (1960), may be regarded as the "irregular biochemical type." In this respect heterogeneity would be representative, as well as the lability of the cultures in respect to saccharose, rhamnose, peptone deficient agar and nitrifying ability. Nevertheless, all the strains studied emerge as a monolithic, clearly defined group.

In considering what has been presented above, we feel it is most convenient to separate the strains isolated in the Armenian SSR, and those analogous to them, into a special subspecies P. pestis semiplenus (semicomplete, semiperfect).

The place of the stated subspecies, conforming to the classification of Tumanskiy, is given in the table.

The proposed name sufficiently clearly reflects the peculiarity of this group of strains, that is, their individualization, and also the intermediate position between the typical P. pestis and the causative agent of pseudotuberculosis of rodents. The separation of the stated cultures into a special systematic unit, in our opinion, may be justified in the sense that it also makes it possible in an acceptable manner to resolve the problem, in the given phase, concerning the place of voles and pikas among the animal-carriers of the plague microbe. In accordance with the proposed nomenclature, at the present time there is no necessity for regarding these rodents to the ranks of the main carriers of P. pestis, which would be at least premature. It can only be said that the voles and pikas may have an independent importance as reservoirs and sources of P. pestis semiplenus.

In this scheme attention is turned to the fact that all the strains of P. pestis, isolated under the conditions of the described epizootic, ferment lactose. Earlier we (Mikhaylova, Filimonova, and Manokhina, 1963) expressed the assumption that the ability to break down lactose is a peculiarity of the Zakavkaz strains of the plague microbe. This assumption was based on the materials from studying cultures which were isolated in various years from red-tailed gerbils and their fleas in Zakavkaz. It would seem that the presence in gerbil and vole strains of such a unique feature indicates a genetic bond between them. However, for strains isolated from voles a characteristic property is the denitrifying capability, by which they may be related to the marmot variety, since the overwhelming majority of gerbil strains conform to the suslik variety of the plague microbe. Thus, clear microbiological data has still not been obtained in regards to the problem of the interrelation between the high-mountain and lowland foci of plague in Zakavkaz.

Apparently, final conclusions will be made in this direction following further investigations and observations. Primary importance here belongs to a study of the problem concerning the possibility and conditions for the transition of P. pestis semiplenus into a typical form and a more exact definition of this transition. In considering the importance of this

problem both in a scientific and practical aspect, a very pressing study is that of the pathogenic properties of P. pestis semiplenus in man-like monkeys, and also a thorough clinical and laboratory investigation of all persons with fevers in regions where epizootics are recorded in voles and pikas.

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Table

Characteristics of the main properties of *P. pestis semiplenus* 1

Taxonomical unit and name of microbe	Main carriers in nature	Main route of circulation of microbe	Clinical-epidemiological data		Main form of microbe	Pathogenesis for		Mobility	Fraction I	Relation to plague bacteriophage	Growth on hungry media	Relation to		Reaction
			Clinical-anatomical picture	Aerial-droplet propagation		Guinea pigs	White rats					Rhamnose	Urea	
Species of <i>P. pestis</i>	Marmot, suslik, rat, gerbil	Transmissive	Plague	+	R	++++	+++	+	+	+	+	+	+	+
var. <i>ratti</i>	Rats	"	Typ.	+	R	++++	+++	+	+	+	+	+	+	+
var. <i>marmotae</i>	Marmots	"	"	+	R	++++	+++	+	+	+	+	+	+	+
var. <i>citelli</i>	Susliks, gerbils	"	"	+	R	++++	+++	+	+	+	+	+	+	+
Supspecies <i>P. pestis semiplenus</i>	Voles, hares ?	"2	?	?	R	+	+	+	+	+	+	+	+	+
Species <i>P. pseudotuberculosis rodentium</i>	Synanthropic, rarely wild rodents	Alim-ent.	Pseudotuber.	-	S	++	-	+	-	-	-	+	+	+

Legend: + positive result; - reaction positive or negative; (+) insignificant portion of strains gave a positive reaction; 1) the table does not reflect properties known to be common for *P. pestis* and *P. pseudotuberculosis rodentium*; 2) based on the data of Z. I. Shchekunova (1957), Brandt's vole was sensitive to *P. pestis* following oral infection.