

Vector-borne diseases and problems of genetic safety

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From 6 to 12 October 2002 at the Institute of General Genetics of the Russian Academy of Sciences, Moscow the First International Workshop "Vector-Borne Diseases and Problems of Genetic Safety" was held by the Moscow Society of Geneticists in support of the programme of the World Health Organization (European office), *Roll Back Malaria*. More than a hundred experts from Russia, Kazakhstan, Kyrgyzstan, Tadjikistan, Uzbekistan, Georgia, Armenia, Azerbaijan, USA, Switzerland and Denmark attended the workshop.

Following the First International Workshop, the international club *Malaria & Co.* was established for information exchange and support of experts engaged in the study of vectors of vector-borne diseases. The first elected co-directors of the Club are Marina Sokolova (VIGG RAS, Moscow), Alla Baranova (Martsinovskiy IMP&TD MPH Moscow) and Abdycadyr Zhorojev (RC SC, Bishkek, Kyrgyzstan). The participants have stated a wish to organize annual workshops for experts to exchange experiences and provide information on the outcomes of activities.

The program included a plenary meeting "Regional policy in the field of genetic safety in connection with vector-borne diseases", and seminars: "Genetics, systematisation and molecular biology of vectors"; "Zoogeography and ecology of vectors of vector-borne diseases"; "Physiology of blood-sucking insects"; and "Epidemiological Services".

Over recent years there has been a serious deterioration of the epidemiological situation in Russia and other States of the CIS due to a number of vector-borne diseases: malaria, haemorrhagic fevers and tick borreliosis. The threat of mass epidemics of vector-borne diseases, which were eliminated in the Soviet Union after perennial control measures, is due to complex political, social, economic and climatic factors. As an outcome of urbanization, populations of endophilic species of mosquitoes have increased. There is a rapid formation of urban strains (races) of some mosquito species.

A concern of many regions of Russia is the import of vivax malaria from Tadjikistan and Azerbaijan. Despite efforts on control undertaken by the European Regional Office of the World Health Organization, the malaria morbidity remains high in those regions. The import of malaria from countries of Asia, Africa and Latin America has led to almost 60000 cases. The number of malaria cases due to local transmission in the European Region of WHO (16 countries), according to official data in 2000, totals 31836. In Russia there were 763 registered cases of malaria, including 47 cases of local malaria in 2000 (Progress with Roll Back Malaria World Health Organization, Regional office for Europe. Copenhagen, Denmark, 2001). The conditions of invasion and transmission of diseases have changed. For example, the so-called "country" malaria has appeared in the sub-Moscow region, due to building teams from Tadjikistan.

Climate change has resulted in changes of genetic structure of populations of vectors of diseases, and also altered the distribution of vectors. The replacement of certain species of mosquitoes and displacement of species by new, more effective vectors was revealed. Alongside an increase of malaria morbidity in Russia, an increase of West Nile fever cases has appeared, transmitted by urban *Culex pipiens* form *molestus* mosquitoes.

Russia, as well as other countries, has met with new approaches to the problems of safety. The new concept of biological safety should take into account the possibility of using vectors of diseases as a means of distributing new infections. The revision of safety will demand, on the one hand, scientific substantiation of developed measures for control of epidemiological situations, on the other hand, appropriate personnel and supply of materials. In this connection it is relevant that in Russia for the last ten years there has been a shortage of entomological staff with only 370 people in the Center of the State Sanitary Service of Russia on 1st January 2003. The education of highly qualified staff has practically stopped in the field of medical entomology and the centralized financing of research on vector biology and ecology has almost completely terminated.

Any epidemiological studies start with systematic diagnostic of species and analysis of their geographical distribution. The available data on species composition of mosquitoes in Russia are based on a 20-30 years old study using traditional techniques. In particular, sibling species - vectors of malaria in the European part of Russia - are not studied.

In the territory of CIS the systematic analysis of all components of genetic structure of mosquito populations, which determine their ability as vectors, was not conducted. Usage of molecular-genetic and population-genetic approaches allows not only precise diagnosis of vectors and infection agents to be made, but also determines the structure of the population core and hierarchy and distribution of an intraspecific grouping in populations.

In the reports made by the participants of the workshop, the estimation of the epidemiological situation of malaria and other vector-borne diseases in the States relating to European Region of WHO is given. The modern situation in the researches on genetics and ecology of vectors and disease agents was presented and the methods of mosquito control were discussed, as well as other problems which the Commonwealth of Independent States, the Former USSR, have met.

In the reports of Dr M. Ejov (European Regional Office of WHO, Copenhagen) and epidemiologists from the States of CIS there was underlined the necessity to bring to the notice of governments and the public information on the threat of recovery of malaria in a number of countries of Europe. Permanently the high malaria morbidity is indicated in Turkey and Tadjikistan (11432 and 18446 cases in 2000 respectively). In Tadjikistan alongside vivax malaria, tropical malaria (*Plasmodium falciparum*) has become distributed. The percentage of patients with tropical malaria reaches up to 5-10%. The situation in Azerbaijan (1529 cases in 2000) was improved a little, however the situation in Georgia, bordering on it has worsened sharply. In 2002 the scale of malaria in south Kyrgyzstan in the Osh area has been revealed. Despite of measures undertaken by the Ministry of Health of Uzbekistan, the actual threat of considerable increase of malaria morbidity has hung above densely populated regions of Fergana, boundary with Kyrgyzstan.

The uncontrolled migration of seasonal workers of Tadjikistan and tradespeople from Azerbaijan has resulted in considerable increase of imported cases of malaria in Russian Federation and occurrence of the secondary foci originated from imported cases as a result of transmission through local mosquitoes. The most adverse regions of malaria are Moscow city and sub-Moscow area, where there were registered half of all cases of imported and local malaria on territory of Russia in 2002 (Baranova, A-M., Moscow).

At the workshop the problems of tick encephalitis and Lyme disease and their *Ixodes* tick vectors were discussed. Now in a number of regions of Ural, Siberia and the Far East the increase of encephalitis morbidity, especially, Lyme disease, is recorded. In the report of Prof A. Babenko (Tomsk, Russia) a high level, up to 45%, tick infection with Lyme agent is present in neighbourhoods of Tomsk. Absence of a vaccine and insufficiently effective diagnosis promote the distribution of this disease.

The main problems, which the sanitary epidemiology services of CIS have met in control the distribution of malaria and other vector-borne diseases, are the lack of effective insecticides and medicinal preparations, poor financing of vector control measures and deficit of qualified personnel. With the purpose of monitoring of vector populations in malaria foci, the European office of WHO in 2002 financed the project on the analysis of genetic structure of populations of the main vectors of malaria in Central Asia (VIGG RAS, Moscow).

The modern molecular-genetic approaches to the possible solution of problems of the control of vector-borne diseases were shown in the reports of Prof. Y. Ture (WHO, Geneva) "Genetic Modification of Mosquito Vectors for Malaria and Dengue Control"; Dr.K. Pyatkov (IBC RAS, Russia) "Genetic transformation of Insects"; Prof G. Sulimova (VIGG RAS, Moscow) "Perspectives of application of molecule-genetic markers in analysis of blood-sucking insects and vector-borne diseases, transmitted by them"; Dr. D. Mukha and A. Chumachenko (VIGG RAS, Moscow) "Densoviruses: the new approach to genetic engineering of insects".

The immunological direction of modern researches of mosquitoes was shown in the reports of Prof. A. Reikhel (USA), Dr. S.W. Shin (USA), Dr. V. Kokoza (USA) and V.V. Glupov (ISZE RAS, Novosibirsk).

The physiology and genetics of reproduction of mosquitoes was considered in the reports of Prof M. Klowden (USA) and Dr. M.I. Sokolova (VIGG RAS, Russia).

General attitude has been expressed in the report of Prof N.G. Gratz (WHO, Geneva) "Hopes for new developments in vector control. The urgency of present needs".

THE PAPERS (abstracts of papers will be given in future issues of the Bulletin)

Molecular polymorphism of *Anopheles* mosquitoes - malaria vectors in Central Asia and Kazakhstan

O.E. Lopatin, A.V. Katokhin and A.I. Shevchenko *Institute of Cytology and Genetics RAS, Novosibirsk Institute of Zoology MES of Kazakhstan, Aimaty, Kazakhstan*

Effect of indirect selection on wing morphology of *Aedes aegypti* (Diptera, Culicidae)

S.B. Ivnitky and R.A. Fondo *Lomonosov Moscow State University, Biological School, Department of evolution Theory*

Opportunities of RAPD-markers application for estimation of population variability and phylogenetic relations of mosquitoes *Culex pipiens*

Maleeva, J.V., Ivnitky, S.B. and Kolesnikov, A.A. *Moscow State University, Russia*

The morphological analysis of malarial mosquito larva of Western Siberia

A.K. Sybataev and M.I. Gordeev *The Research institute of Biology and Biophysics at Tomsk State University, Vavilov Institute of General Genetics RAS, Moscow*

Biological distribution and karyotypic structure of malarial mosquito populations of Western Siberia

V.P. Perevozkin and M.I. Gordeev *Tomsk State Pedagogical University, Vavilov Institute of General Genetics RA, 5 Moscow*

Chromosomal mapping of malarial mosquito *Anopheles hyrcanus* in Dagestan

S.S. Gadjeva *The Dagestan State Pedagogical University, Russia*

Distribution of the cytoplasmic bacterium *Wolbachia pipientis* in mosquitoes *Culex pipiens pipiens* and *Culex pipiens molestus* in connection with origination of urban populations of mosquitoes

E.B. Vinogradova, I.A. Zakharov, M.V. Fedorova and E.V. Shaikovich *Zin RAS, St. Petersburg, VIGG RAS, Moscow, MSU, Moscow*

Effects of males on female mosquitoes

Marc J. Klowden *Division of Entomology, University of Idaho, Moscow, Idaho, USA*

Mosquito oogenesis

M.I. Sokoloya, H.S. Zelentsova, N.G. Shostak and M.B. Evgen'ev *Vavilov Institute of General Genetics, Engelhardt Institute of molecular Biology RAS*

Genetic transformation of insects

K.I. Pyatkov *Institute of Cell Biophysics, Puschino, Russia*

Epidemiological characteristic of malaria in modern Russia

A.M. Baranova *Martsinovsky IMP&TM, Moscow*

Epidemiological features of a malaria in the Voronezh area

L.Y. Ivanova, M.I. Chubyrko *Center of the State Sanitary Epidemiology Service of the Voronezh Region*

About malaria morbidity on the territory of Voronezh-city

N.P. Mamchik, L.P. Usacheva and E.P. Gerik *Center of the State Sanitary Epidemiology Service in Voronezh*

Malarial situation in Republic Kazakhstan

A.A. Katrenova *The Ministry of Public Health of Kazakhstan*

Value of control measures against blood-sucking insects in preventive maintenance of malaria in Kazakhstan

E.N. Anpilova and Zh.Zh. Shapieva *Kazakh Republican SanitaryEpidemiology, Station*

Malariogenic situation in Republic of Uzbekistan and malaria preventive measures in post-eradication period (1961-2002) R.N. Mannanova, A.A. Mansurov, C.B. Showmarov and I.T. Abdullaev *Republican Center of State Sanitary Epidemiology Survey of the Ministry of Public Health of Republic of Uzbekistan*

Malaria return in Kyrgystan

A.A. Zhoroiev Republican Center of Sanitary Epidemiology Survey, The Ministries of Public Health of Kyrgyzstan

Epidemiology of malaria and visceral leishmaniasis in Georgia

M. Kadagashvi Medical Parasitologic Service, Tblisi, Georgia

Malaria and leishmaniasis vectors in the Azerhaijan Republic

N.G. Mutdalibov Republican Center of Hygiene and Epidemiology, Baku Azerbaijan

Entomological situation of malaria in Republic Armenia

L.A. Khigatyan Republican Center of the Control of Infectious Diseases, Yerevan, Armenia

Results of cooperation between the Center of the State Sanitary Epidemiology Survey (CSSSES) and Municipal Unitary Firm "Hygiene" at the Health Resort Anapa on health protection of the population against blood-sucking insects

L.I. Lavyerova, L.R. Oksuzian and I.I. Kazantseva *Center of the State Sanitary Epidemiology Survey at the Health Resort Anapa Krasnodar Territory, Russia*

Entomological survey of ticks - vectors of vector-borne diseases in Rostoy - on-Don city

T.N. Mikhailova, N.F. Pashintseva, E.I. Feodoridis, S.I. Fedoruk, S.A. Nenadskaya, N.V. Sedyakova, S.I. Serikova, N.F. Lutokhina, O.V. Goncharova and G.A. Ananchenko *Center of State Sanitary Epidemiology Survey in Rostov-on-Don city*

Analysis and prognosis of the population dynamics of malaria mosquitoes *Anopheles messeae* Fall., in connection with the malaria situation in the Urals Region

N.V. Nikolaeva *Institute of Plant and Animal Ecology, Ural Branch of RAS, Ekaterinburg*

The general zoogeographical characteristic of fauna of blood-sucking insects of eastern part of Big Caucasus and new approach to a problem of objective zoning Sh.I. Ismailov *The Dagestan State Pedagogical University*

The fauna-ecological characteristic of populations of malarial mosquitoes (Culicidae, Anophelinae) in Center of European part of Russia F.A. Skripchenko *The Vladimir State Pedagogical University, Russia*

Integrated biological control of mosquitoes and black flies - a global perspective

Y. Margalith *Center for Biological Control (CBC), Department of Life Sciences, Ben-Gurion University of the Negev*

***Brevibaccillus laterosporus* - potential agent for biological mosquito control** M.V. Orlova, T.A. Smirnova, L.A., Ganushkina and P.P. Azizbekyan *State Scientific Research Institute of Genetics and Selection of Industrial Microorganisms Laboratory of Genetics of Biopesticides*

New approaches to improving of vaccines against tick-borne encephalitis

M.V. Khoretonenko and A.V. Timofeev *Lomonosov Moscow State University, Chemistry Department and Chumakov Institute of Poliomyelitis and Viral Encephalitis RAMS.*