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EPIDEMIOLOGICAL SURVEILLANCE OF MALARIA IN COUNTRIES OF CENTRAL AND EASTERN EUROPE AND SELECTED NEWLY INDEPENDENT STATES

Report on a WHO intercountry meeting

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ABSTRACT

Many of the countries of central and eastern Europe (CCEE) and newly independent states (NIS) remain vulnerable to the resumption of the local transmission of malaria. In recent years, autochthonous cases have been reported in Belarus, Bulgaria, Greece, Italy and the Republic of Moldova. The WHO Regional Office for Europe convened a meeting to review both imported malaria and local transmission in the CCEE and NIS, to analyse and exchange experience with malaria surveillance and prevention, and to outline a strategy to prevent the reintroduction of malaria and other vector-borne diseases. The participants recommended that:

- WHO streamline mechanisms to make surveillance more effective and appropriate to the conditions and needs of each country;
- Member States assess their national malaria surveillance systems and ensure that sound and evidence-based strategies for surveillance and prevention are in place;
- the participants and WHO try to raise awareness of the importance of malaria and the risk of its re-emergence in national governments, health services and local authorities.

Keywords

MALARIA – prevention and control – epidemiology
STRATEGIC PLANNING
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CONTENTS

Page

Executive Summary

Among the health priorities of the countries within the WHO European Region, the control of infectious diseases, including malaria, is one of the highest. Since the early 1990s, the malaria situation in the Region has deteriorated considerably, owing to political and economic instability, massive population movements, and large-scale development projects. In recent years, Azerbaijan, Tajikistan and Turkey have suffered explosive and extensive epidemics, while Armenia, Turkmenistan and Georgia have faced small-scale outbreaks. In 1995, a total of 92 048 malaria cases were reported in malaria-affected countries of the Region. The development and implementation of the regional Roll Back Malaria (RBM) strategy, strong national political commitment to tackle the disease, intensive support from WHO (both headquarters and the Regional Office for Europe), a high level of advocacy for action against malaria, and broad RBM partnership, with considerable financial assistance and particular focus on the local malaria situations, have brought about a substantial reduction in the reported incidence of malaria in the Region. During 1996–2001, the reported number of malaria cases declined from about 91 723 to less than 20 000.

Despite the considerable impact of the RBM programme on the malaria situation in the Region, some countries in Central and Eastern Europe and in selected Newly Independent States continue to remain highly vulnerable to a resumption of malaria transmission. In recent years autochthonous cases of malaria were reported in Bulgaria, Italy, Republic of Moldova, Belarus and Greece.

1. Introduction

The meeting on Epidemiological Surveillance of Malaria in Countries of Central and Eastern Europe and Selected Newly Independent States, organized by the WHO Regional Office for Europe was held in Sofia, Bulgaria from 24–26 June 2002. The participants (Annex 2) included representatives from countries of seventeen countries of the WHO European Region and WHO staff.

1.1 Scope and purpose of the meeting

The objectives of the meeting were:

- To analyse and exchange experiences on malaria surveillance and prevention among participating countries.
- To outline a strategy for prevention of the re–introduction of malaria and other vector-borne diseases in participating countries, with particular emphasis on strengthening malaria surveillance mechanisms at country and intercountry levels.

1.2 Inaugural session

The meeting was inaugurated by Dr Bojidar Finkov, Minister of Health of Bulgaria who emphasized the need for improved cross-border cooperation in the field of surveillance of infectious diseases including malaria, and expressed his appreciation to WHO for organizing this meeting. Dr Mikhail Ejov, Roll Back Malaria, WHO European Office for Europe, speaking on behalf of Dr Marc Danzon, Regional Director, outlined the objectives of the Roll Back Malaria

Programme within the WHO European Region and the progress achieved to date. He informed of the factors leading to the resurgence and spread of malaria across the Region, and of the strategies applied to reduce its incidence, contain outbreaks, prevent its re-establishment in areas where it had been previously eradicated, and maintain the malaria free status of other areas climatically and geographically suitable to the re-establishment of the transmission of malaria.

1.3 Organization of the meeting

The first half of day one of this two-and-a-half day meeting was used to provide participants with an overview of the malaria situation worldwide, including an update on the Roll Back Malaria movement, to inform on progress with RBM in the WHO European and Eastern Mediterranean Regions, and to acquaint participants with malaria as a growing medical health problem in Europe. The second half of the day was devoted to discussions on other vector-borne diseases in Europe aside from malaria and the bio-rational control measures undertaken by the German Mosquito Control Association. Day one of the meeting was concluded with a discussion on the lessons learned, progress, and challenges with RBM in two malaria-affected countries of the WHO European Region, Armenia and Tajikistan. The second day of the meeting was devoted to individual country presentations on imported malaria and surveillance strategies applied. The final day of the meeting was used for group work discussions, presentations, and recommendations from three working groups (see Recommendations, 7.0).

2. Current malaria situation

2.1 World Update on Roll Back Malaria, M. Ejov

Malaria, together with HIV/AIDS and tuberculosis, is one of the major public health challenges undermining development in the poorest countries of the world. Approximately 20% of the world's population, in over 100 endemic countries, lives at risk of malaria. 90% of the over one million malaria related deaths to occur annually take place in Africa. Malaria is a disease of poverty, to which children and pregnant women are particularly vulnerable. Complicating the present-day situation is the growing resistance of *P. falciparum* to antimalarial drugs and the complex emergency situations, including war, food shortages, and the displacement of large population groups that characterize many endemic countries. Roll Back Malaria is a global partnership founded in 1998 by WHO, the United Nations Development Program (UNDP), United Nations Children's Fund (UNICEF), and the World Bank with the goal of halving the world's malaria burden by 2010. RBM strategies include prompt access to malaria treatment with effective drugs, the promotion of the use of insecticide treated mosquito nets, and the improvement of responses to emergency situations and epidemics.

2.2 RBM in the WHO European Region, M. Ejov

Within the 51 countries of the WHO European Region, some of the major malaria-related issues faced today include ongoing epidemics and outbreaks, the expansion of endemic areas, the spread of *P. falciparum*, underestimation of the toll of this disease, and rising trends in regards to imported malaria. In the countries of Tajikistan and Turkey, malaria remains a major public health problem, whereas in Georgia, Kyrgyzstan and Uzbekistan, the disease is beginning to assume epidemic proportions. Countries such as Armenia, Azerbaijan and Turkmenistan have succeeded in containing malaria outbreaks, and the results achieved must be sustained. Yet other

countries face sporadic cases and the risk of the further spread of malaria. Within the European Region, it is estimated that between 65–80 million persons live in areas at risk of malaria. Other issues of concern include the deterioration of the malaria situation within border areas of central Asian countries and the return of endemicity in the southern part of Tajikistan. Some of the main reasons behind the resurgence and spread of malaria over Europe include the disruption of historical ties between the countries of the former Soviet Union, socioeconomic instability, uncontrolled population movements, deterioration of health infrastructures and services, and shortages of basic supplies. RBM aims to support affected countries through the provision of advisory assistance and essential supplies, strengthening technical and managerial capacities at the country level, improving capacities for the timely response to epidemics and outbreaks, reinforcing surveillance mechanisms, supporting operational research, and strengthening cross-border coordination. To date, visible progress has been made and there has been a substantial decrease in the reported incidence of malaria in the Region.

2.3 Imported malaria as a growing medical health problem in Europe, P. Jørgensen

Over the course of the past 30 years, more than 230 000 cases of imported malaria have been reported in the 51 countries of the WHO European Region. More than 50% of these cases were reported during the period 1990–2000. Malaria is most often imported into the western part of Europe, particularly into the European Union, where more than 90% of all imported malaria cases in 2000 were recorded. The largest number of cases recorded within this 30-year period is the 8056 cases imported into France in the year 2000. The United Kingdom of Great Britain and Northern Ireland (2069 cases reported in 2000) together with France accounted for about 65% of all imported malaria cases in the WHO European Region in 2000. The number of imported malaria cases has been steadily increasing since 1974, and there has been an inexorable rise in the number of *P. falciparum* cases reported. The vast majority of malaria infections in European residents are due to *P. falciparum*, accounting for 69.9% of all imported cases in 1998–2000. A smaller fraction of the cases are due to *P. vivax* (16.7%), while *P. ovale* and *P. malariae* account for 5.1% and 1.5% of the imported cases respectively. Mixed infections are seen in 1.8% of the cases, and in 4.9% of all cases the species of *plasmodium* is not known. In the period 1998-2000, 15 071 males acquired malaria, while the number of females infected was 7590, figures representing a distribution rate of approximately 66% and 34% respectively. As regards to the distribution of malaria cases by age groups, the data shows that most patients were in the age groups of 21–30 years (24.2%) and 31–40 years (23.9%).

2.4 RBM in the WHO Mediterranean Region, H. Atta

In 2001, the Regional Office for the WHO Mediterranean Region substantially strengthened its capacities to provide assistance to countries in rolling back malaria. Countries were assisted in developing human resources and specific RBM strategies, and multiple strategic approaches were implemented. Areas of focus included epidemic preparedness and response, disease management, reduction of malaria transmission, and safe pregnancy. Pilot projects were initiated/implemented in endemic countries, including the eradication of malaria from Scotora Island in Yemen, and achieving malaria free status of Khartoum and Gezira in Sudan. Ten countries of the Region, including Bahrain, Cyprus, Egypt, Jordan, Kuwait, Lebanon, Palestine, Qatar, Tunisia and United Arab Emirates, were able to maintain malaria free status in 2001. Morocco and Oman made progress towards the eradication of malaria, with no local cases

detected in 2001. More than 90% of the estimated 15 million malaria cases occurring in the Region annually arise in the countries of Afghanistan, Djibouti, Somalia, Sudan and Yemen.

3. Vector control issues

3.1 The problem of vector-borne diseases in Europe aside from malaria, N. Gratz

Although malaria was, at one time, the most important vector-borne disease in Europe and the risk of its resurgence remains high, there are a substantial number of other vector-borne diseases endemic in Europe, many of which are of considerable public health importance. Many of these infections are mosquito-borne, whereas others are transmitted by sand flies, fleas, lice and ticks. Inasmuch as the groups responsible for the control and prevention of malaria are often responsible for the control of other vector-borne diseases as well, it is essential to be aware of the epidemiology and distribution of these infections, their epidemiology and incidence and the methods of their control.

Among the arboviruses, the most important and widespread mosquito-borne disease in Europe is the West Nile virus; this has been the cause of serious outbreaks in Romania, Russia and France. It is transmitted by several *Culex* species and further outbreaks are likely. Other mosquito-borne arboviruses such as Ockelbo virus may have a high incidence in localized areas.

Ticks, particularly *Ixodes* species, are the vectors of several diseases of public health importance in Europe, amongst them tick-borne encephalitis, spotted fever, relapsing fever and the very widespread Lyme disease. Both TBE and Lyme diseases are transmitted over large areas, and their incidence is increasing.

Sand flies transmit sandfly fever, and are especially important as vectors of leishmaniasis in southern Europe. HIV/leishmaniasis dual infections represent a serious and steadily growing problem.

Several emerging and resurging vector-borne diseases such as Ehrlichiosis, trench fever, and Congo Crimean haemorrhagic fever are of focal importance. Europe is also threatened by the possible importation of the mosquito-borne Rift Valley fever from Africa or the Middle East.

3.2 The bio-rational control of nuisance and vector mosquitoes, N. Becker

The discovery of toxin-producing mosquitocidal bacilli such as *Bacillus thuringiensis* subsp. *israelensis* in 1976 and potent strains of *Bacillus sphaericus* in recent years, inaugurated a new chapter in the control of mosquitoes and black flies. The rapid exploitation of microbial control agents was aided by the relative ease with which they could be mass produced, their high efficacy, enormous environmental safety, ease of handling, relatively low risk for the development of resistance, cost-effectiveness, and the ease with which they can be integrated into control programmes involving community participation. At present, *B.t.i.* is successfully used annually by hundreds of tons in many mosquito and black fly control programmes worldwide in temperate and tropical climatic zones. An average of 300 000 litres of *B.t.i.* are applied annually in West Africa against the black fly-vectors of onchocerciasis. In Germany, the German Mosquito Control Association (KABS) has developed a control programme against

nuisance mosquitoes based solely on the use of *B.t.i.* and other biological control tools. For 20 years, nuisance mosquitoes have been avoided by the use of various *B.t.i.* formulations in an integrated biological control programme in Germany. In China, *B.t.i.* treatments against *Anopheles sinensis* as the main vector of malaria have led to a significant reduction of malaria incidence. In Kenya, Indonesia, Peru and Ecuador, field tests have shown promising results against malaria vectors such as *Anopheles gambiae, An. nigerrimus, A. sundaicus*, and *A. albimanus*.

B.t.i. tablets are a promising formulation for use in artificial containers in the fight against *Aedes aegypti* as a vector of dengue. Due to its potential to persist and recycle in polluted water, *B. sphaericus* is the most promising biocidal candidate for controlling the larvae of *Culex quinquefasciatus*, the main vector of lymphatic filariasis, as well as the larvae of *An. gambiae*, the main vector of malaria in Africa. In large-scale field trials in north Cameroon, Brazil, India, Sri Lanka and Tanzania, the impact of *B. sphaericus* treatments has been remarkable. The bi-monthly treatment of larval mosquito habitats has successfully reduced the density of biting vectors by 80%. In Kenya, a control strategy against malaria vectors has been designed using both *B.t.i.* and *B. sphaericus* products synergistically.

4. Country presentations

Each of the participating countries was requested to make a presentation on the malaria situation in their country and the manner and effectiveness of their epidemiological surveillance systems in preventing the re-establishment of malaria in their country. Abstracts from each participating country are given below:

4.1 **Albania,** E. Velo, S. Bino, A. Shehi and P. Vasili

In 1938, malaria was a hyper-endemic disease in Albania, exhibiting a spleen and parasite rate of 60%. In 1946, the insecticide DDT was introduced and applied to household interiors. A National Plan for the Eradication of Malaria was prepared in 1957 according to WHO recommendations. The main measures included a vigorous combination of vector control measures such as a nationwide spraying campaign for the treatment of houses with DDT, active screening of new cases, house screening and their treatment, and two years of follow up, as well as felling, drainage and land-fill. The surveillance of imported cases of malaria was established during this same period. This multi-faceted and carefully planned programme containing agricultural and economic interventions led to the successful eradication of malaria in Albania in 1967. The Anopheles species found in Albania include *Anopheles maculipennis* (typicus), Maigen, *An. sacharovi*, Faver and *An. Superpictus*, Grassi, as described by Hacet (USA), Dr. Ashta and Dr. Adhami, all of which are recognized as vectors of malaria. Environmental changes which took place after 1965, including drainage and landfill measures, was accompanied by a decrease in the density and spread of *An. sacharovi*, the most common vector of malaria in Albania. At the same time, the construction of drainage ditches and the spread of rice fields from the Buna River to the Konispoli field created conditions favourable to an increase in the rate of *An. maculipennis*. Meanwhile, the main vector in hilly or mountainous areas, near rivers and in fields remained *An. superpictus*. During the 1970s, 15 years after the cessation of house spraying with DDT, and as a result of environmental changes, soil erosion, alterations in water salinity or organic matter, pesticide pollution, and the disappearance of vegetation in many areas, the populations of *An. superpictus* were further reduced. Mosquito

control is rendered increasingly difficult due to the development of insecticide resistance in many species of Anopheles. The first experience of Anopheles sensitivity to insecticides was described by Dr. Jorgji Adhami, who observed this in various sites of the coastal and lowland areas of Albania.

The first imported malaria case in Albania was registered in 1962, and by 2002, the number of cases had reached 38. Of these cases, only two occurred amongst Albanian citizens. The majority of cases (77.2%, or 23 cases) were contracted in Asia and China; 14% (14 cases) were contracted in Africa; and only 1 was contracted in South America. The period between 1964-1971 represented a time of intense collaboration with Chinese specialists; thus explaining the many cases to be reported from that area during this period. Most cases occurred in males above 20 years old. *Plasmodium vivax* accounted for 63.15% of cases, whereas *P. falciparum* was the source of 31.57% of cases. Only one case of mixed infection (*P. falciparum* and *P. vivax*), representing 5.28% of reported cases, was recorded. The disease has been diagnosed in May and July. In 52.63 % of cases, a diagnosis was reached within three days, and in 84% of cases, it was reached within six days. In one case, that of *P. vivax*, a diagnosis was reached only after seven months. As the number of cases reported has remained very low, Albania has not experienced local transmission of malaria. Also, most of the cases reported have occurred in Tirana, further lowering the potential for transmission. Reporting a case of malaria in Albania is mandatory, and this comprises an element of the National Mandatory Reporting System. Also, in light of the high densities of mosquito species within some areas in Albania, a Ministerial Commission was established in 2001 with the support of the Ministry of Health in Albania. The purpose of the Commission is to compile a Country Vector Control Strategy Control proposal, of which a draft is currently being elaborated.

4.2 **Armenia,** A. Keshishjan

Malaria is suspected to have been present in Armenia since ancient times. Owing to favorable environmental and climatic conditions, the disease was widespread in the country. As a result of an effective malaria control campaign, malaria was eradicated from Armenia in 1963, however, in 1994, imported cases began to appear as a result of socio-economic and political changes in the region. In 1994, 196 imported cases were reported and by 1996, both local transmission and imported cases were witnessed. There were 347 cases of malaria in that year. Two years later, in 1998, 1156 cases were reported, 542 of which were the result of local transmission. As a result of the support from the WHO, the incidence of the disease began to decline, and in 2001, only 79 cases were recorded, 1.7 times less than in 2000. The distribution of these cases was more widespread, however. Support from the WHO in 2001 included the provision of funding a.o. to hold seminars for parasitologists, entomologists and medical officers of clinics.

4.3 **Belarus,** V. Kluchenovich

Due to its climatic and geographical conditions, Belarus is considered a low-risk country for malaria transmission. However, this does not exclude the possibility of the re-establishment of local foci and the occurrence of local malaria transmission which took place in the 1940s and 1950s, when up to 300 000 cases of locally transmitted malaria were registered annually. Indeed, a number of factors point to the possibility that local transmission may again take place.

Entomological studies have shown the presence of four *Anopheles* species in the country, mainly *An. maculipennis*, *An. messae*, *An. claviger* and *An. atroparvus*. Moreover, population densities are quite high as a consequence of many available larval habitats.

As a result of the large number of immigrants into the country between 1992 and 2001, 114 cases of malaria have been reported during this period. All of these cases were imported and 5 were relapses of imported malaria. There was one death due to drug resistant *P. falciparum*. Among these imported cases, 71.5% were *P. vivax*, 25.3% were *P. falciparum*, 2.4% *P. malariae* and 0.8% were *P. ovale*. Of the total, 6.5% were mixed infections.

The source of these infections were: Africa 34.2%, Asia 23.6%, South America 1.6%, and 40.6% were from NIS countries, including Azerbaijan, Georgia, Russian Federation, Tajikistan, Turkmenistan and Uzbekistan.

The strategic objective of the sanitary epidemiological services is the prevention of the establishment of local transmission of malaria, and this is undertaken by identification and diagnosis of cases, especially of those imported cases with parasites and the control of potential vector populations. Plans have been formulated for the control of any foci which may become active.

4.4 Bosnia and Herzegovina, R. Bratic

Surveillance activities have contributed to a reduction in malaria within the Republic of Srpska from 1993–2001. Factors that influence the appearance of malaria in the country will be discussed, and emphasis will be placed on the increasing role of public health services within the context of the new circumstances that have arisen in Eastern Europe over the continuing period of transition. Retrospective surveillance on the movement of malaria in the country within the period from 1993 to present has been used. Public health reports published monthly, periodically and annually illustrate the distribution of this disease.

From 1993 to present, the Republic of Srpska has registered a total of four cases of malaria. Three of these cases occurred in 1997, two cases in the area of Zvornik (of which one case proved fatal), and one case registered in the area of Bratunac. In all three cases, the diagnosis was imported malaria caused by *Plasmodium falciparum* .All three cases were acquired in Africa. All patients were provided with anti-malaria chemical prophylaxis. In the year 2000, another case of imported malaria was reported. The originating country was recorded as Ghana. While the number of malaria cases reported to date remains small, health officers predict that numbers are likely to increase in the future, given the large number of workers and tourists travelling to tropical areas.

Given the epidemiological characteristics of this disease, national health authorities provide the requisite chemical prophylaxis for international travellers in accordance with existing regulations, as well as employing the vitally important measure of surveillance on travellers returning from destinations where malaria is prevalent, as well as adequate treatment of confirmed cases of the disease. Also of great importance is coordination with central and east European countries in matters concerning the prevention of this disease and applying WHO recommendations concerning surveillance on malaria.

4.5 **Bulgaria,** R. Kurdova-Mintcheva

Malaria in Bulgaria was characterized in the past by high endemicity with periodic epidemics and wide distribution, favoured by geographical, climatic and social factors. A national malaria eradication program led to the eradication of malaria as an autochthonous disease in the country in 1965.

Following the eradication of malaria, the receptivity and vulnerability of the territory remained at a critical level. During the period between 1966 and 2001, a total of 2915 malaria cases were recorded, including 2865 imported cases, resulting from infection mainly with *P. vivax* (54.28%) and *P. falciparum* (38.95%), with ten deaths occurring as a result of delayed diagnosis and lack of appropriate ethiological treatment as a result of patient delays in seeking medical assistance, 25 induced cases, 7 relapses, and 18 autochthonous cases. While in the past malaria was imported largely from Asia, most cases from 1991 to 2001 were contracted in Africa – 312 (82.54%) cases; followed by Asia – 65 cases (17.20%); and Oceania – (0.26%). Since 1986, *P.falciparum* has been the main cause of imported malaria. From 1966 to 1990, mostly foreigners (74.76%) imported malaria into Bulgaria. However, over the past 11 years, 378 cases, or 70.90%, were imported by Bulgarian citizens. After the eradication of malaria, a great number of imported cases (58.98%) were detected during the potential malaria season in Bulgaria (April-October). This is an indication of the existence of a potential risk of the reintroduction of malaria, especially in cases of delayed diagnosis and treatment. A confirmation of the existing hazard was the outbreak of autochthonous malaria registered in the region of Blagoevgrad in 1995–1996. Unfavourable factors in regards to the source of infection included a critical level of malaria import, intensified international relations, an increase in the migration of the population, and the steadily increasing numbers of immigrants.

Malaria surveillance in the country is in large part an operative action presented by a system of complex measures, including the registration of contingents at risk, diagnosis, treatment, prophylaxis and anti-epidemic activities regarding imported and possible indigenous cases. Such activities are aimed at the limitation of malaria import and the prevention of its consequences. Since 1999, there is no compulsory registration and follow up of all Bulgarian citizens arriving from countries to which malaria is endemic, as the medical installations which previously functioned at the borders have now been closed. Measures are carried out only for those persons who seek pre-travel medical advice and post-travel assistance, including a follow-up and laboratory examination on clinical and epidemiological indications. The following activities are conducted in the case of detection of imported malaria: hospitalization and radical treatment, prompt notification of the Ministry of Health, epidemiological and entomological investigation, and implementation of appropriate measures regarding the source and vector in focus.

4.6 **Croatia,** B. Aleraj

Malaria was endemic in Croatia in the past, but owing to the wide, well-organized anti-malarial campaign in the late 1940s and 1950s, this devastating disease was successfully eradicated. Croatia has been officially free of autochthonous malaria since 1962. The last autochthonous case occurred in 1952. Since then, however, a certain number of imported cases were registered annually (notification is compulsory, and parasitological diagnosis and confirmation is required for every case). Over the last ten years, figures were as follows:

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
No. cases *	7	14	15	11	9	9	9	9	8	6

* all imported

All patients are treated in hospitals within infectious disease wards or the main infectious disease hospital. For each case of malaria, an epidemiological investigation, including completion of a standard questionnaire, is performed, followed, if necessary, by targeted control measures. All case reports and questionnaires are collected by the Epidemiology Department of the Croatian National Institute of Public Health which plays the role of a national CDC. Information about the most likely area of origin, duration of stay, species of *Plasmodium*, chemoprophylaxis, therapy, resistance to anti-malarial drugs, etc. are routinely monitored and analyzed. Over the last ten years, the majority of cases registered and treated in Croatia were acquired in Africa, mainly in sailors and persons working abroad.

In order to prevent a reintroduction of malaria into the country, a series of individual and public preventive measures are routinely applied, mainly those prescribed by health laws.

4.7 Czech Republic, E. Nohýnková and I. Rubík

Malaria was eliminated from the former Czechoslovakia during the late 1950s. The last case of autochthonous malaria was recorded in 1958. Since 1963, Czechoslovakia has been a malaria-free country, and from that year forward, any case of malaria detected in the country has been imported. Starting from 1993, when Czechoslovakia was politically separated into independent Czech and Slovak Republics, 30 to 40 cases of malaria have been imported to the Czech Republic per year. Of these, approximately half are due to *Plasmodium falciparum* infections, while malaria tertian mainly caused by *P. vivax* represents the rest of the cases. Traveling to malaria-endemic countries, especially to sub-Saharan Africa without appropriate chemoprophylaxis, was the main cause of malaria for Czech citizens in the early 1990s, with 3 deaths resulting from malignant malaria during 1993–1998. In recent years, following improvement of overall public knowledge on prevention of the *P. falciparum*, the majority of imported cases are due to *P. vivax* infections acquired in southeast Asia. The Czech Republic is a member of a European Network of Imported Infectious Diseases Surveillance, which focuses on imported malaria, amongst other infectious diseases.

4.8 The former Yugoslav Republic of Macedonia, K. Vasilevska

The prevention of the resurgence of malaria is an important function of the Public Health system of The former Yugoslav Republic of Macedonia, and great attention has been given to imported cases of the disease. Records have been kept of all imported cases, and travellers coming from or travelling to malaria endemic areas are subject to close observation. In the period 1980–1995, a total of 33 imported cases occurred, with three deaths registered, all of the latter from *Plasmodium falciparum*. Most of the cases were males in the 19 to 40 years age group.

The preventive measures taken have proven effective, and there have been no imported cases of malaria reported in the last six years.

Anti-malarial drugs are given to travellers one week prior to departure, and a supply adequate for the duration of his or her stay in the endemic area is provided. Returning travellers are controlled at arrival and, if necessary, a blood examination is carried out in the parasitological laboratory.

Close contact is kept with WHO to obtain information on imported and local malaria cases in the region.

4.9 **Greece,** N. Vakalis

Malaria was eradicated in Greece in the early 1970's. Since then, only imported cases have presented a major problem. Over the past decade, the number of imported malaria cases recorded annually has ranged from 24 to 45. The majority of cases occur in immigrants and those travellers to malaria endemic countries who have not taken the appropriate chemoprophylaxis.

Since 1991, only sporadic autochthonous malaria cases have been recorded (3 cases in 1991, 1 case in 1999 and 2 cases in 2000), which do not impose a particular concern to health authorities. Extensive entomological studies have been performed in different parts of the country and the *Anopheles* species *(An. maculipenis, An. sacharovi, An. superpictus*) involved in malaria transmission as potential vectors were recorded.

Within the framework of malaria surveillance, prevention and control in Greece, all necessary activities for mosquito control are performed throughout the year. Furthermore, all immigrants arriving from countries where malaria is endemic are tested to determine if they are parasite carriers. Laboratory and clinical personnel are trained for the early diagnosis and treatment of malaria.

4.10 **Hungary,** Z. Szénási, A. Vass, M. Melles, I. Kucsera, J. Danka, A. Csohán and K. Krisztallovics

Malaria was endemic in Hungary for many centuries. A countrywide survey of the epidemiological situation in regards to malaria was initiated in 1927 and carried out by the Department of Parasitology of the State Institute of Hygiene. Case notification for malaria was made compulsory in 1927. Free of charge laboratory examination of the blood of persons suffering from malaria or suspected of having an infection was also carried out by the State Institute of Hygiene (the present-day National Centre for Epidemiology). Anti-malarial drugs were distributed free of charge, along with appropriate medical advice, through the anti-malarial sanitary stations. The highest number of reported cases was several thousand per year (1933–1943), although the actual number of malaria cases was estimated as high as 10-100 000. The situation worsened in 1944–1945 as a consequence of the Second World War. A major breakthrough came in 1949, when an organized anti-malarial campaign was accompanied by the application of DDT for the control of vector mosquitoes. The resulting drastic reduction in vector densities resulted in the rapid decline of malaria cases and the eventual cessation of transmission.

Since 1956, no indigenous cases of malaria have been reported in Hungary. In 1963, Hungary entered the official WHO register of areas in which malaria eradication had been achieved. During the period of 1963-2001, 170 Hungarians and 261 foreigners imported malaria to Hungary. More than half of these cases (217) were caused by *P. falciparum.* Another 168 cases were caused by *P. vivax,* and 46 cases by other *Plamodium* species. During this period, seven fatal cases were reported (*P. falciparum*). The expansion of migration, both in terms of the increasing number of foreigners travelling into Hungary and of Hungarians travelling abroad, predisposes the appearance of imported cases. In order to avoid the importation of malaria to Hungary, all persons travelling to malaria endemic countries are made aware of the importance of malaria prevention by the international vaccination posts located within the National Centre for Epidemiology and in the public health institutes of 19 counties and Budapest.

4.11 **Moldova,** M. Magdei, V. Sohotschi and A. Colofitschi

From 1971–2001, a total of 655 cases of imported malaria have been reported in the Republic of Moldova, with the total number of cases reported annually varying from 1 to 74. The greatest number of cases occurred in the period 1979–1989. Clinically confirmed cases and parasite carriers (including recurrent cases) comprised 66.7 and 33.3% respectively. Malaria was imported both through the movement of the population abroad (in 49.8% of the cases) and by foreigners (in 50.2% of cases). The majority of cases were imported from Africa (54.6 %) and Asia (40.4 %), with the causative agents of *P. falciparum* (52.8 %) and *P. vivax* (40.6 %).

Among the malaria vectors, *Anopheles maculipennis* (77.6%) was the most common species. A trend in terms of the growth of the population densities of *An. atroparvus*, a species capable of transmitting malaria even during the cold period of the year, has been observed (from 4% to 10% of the population found between 1986 and 1996).

Over the past 10 years, the measures taken against malarial mosquitoes decreased significantly, and as a result, the number of mosquitoes per $1m^2$ of entomologically investigated areas consisted of 120–250 mosquitoes in 1990, whereas in 2001, their number reached 300–800 and even more in selected territories. The season of malaria transmission has a length of 4.5–5 months.

Taking all the above-mentioned into account, we consider the Republic of Moldova a high risk area in terms of the spread of malaria, a risk which is increasing from year to year as a result of the sudden reduction in measures to control and prevent malaria.

To avoid epidemiological outbreaks and complications, it is necessary to provide technical and financial support to the performance of complex anti-malaria measures. The appearance of malaria could lead to serious economic and medical consequences for our Republic.

4.12 **Poland,** A. Kotlowski

The epidemiological situation in regards to malaria in Poland changed dramatically from the beginning of the twentieth century to the mid-1950s. Poland was transformed from an endemic country facing huge epidemics of malaria into a country with only sporadic imported malaria cases. From 1946–1949, the mean incidence of new cases was relatively high (up to 390 per 100 000 citizens in some northern parts of Poland). Several local outbreaks of malaria also occurred within the central and eastern parts of the country. Since 1956, Poland has been officially recognized as free of autochthonous malaria. However, the potential risk of the reintroduction of *P. vivax* species seems to be quite possible. A continual increase in the number of travellers to endemic regions and the presence of immigrant labourers and refugees lead to the urgent need to maintain constant monitoring of the epidemiological situation. The most pressing concern is that local mosquitoes could acquire the parasite from infected persons. Investigations were carried out by entomologists from the Institute of Maritime and Tropical Medicine in 2000–2001 on sibling species of the *Anopheles maculipennis* complex using a PCR technique. Out of samples tested, 77.4% were *An. messeae*, 19.7% *An. maculipennis s.s.*, and 0.4% *An. atroparvus*.

From an epidemiological point of view, the national public health services and district sanitary inspectors, supervised by the State Sanitary Inspector and the relevant departments of the Ministry of Health, are at present in a maintenance phase and operations are vigilant. According

to Polish health regulations, each active case of malaria must be hospitalized, officially notified by district sanitary inspectors, and reported to the National Institute of Hygiene in Warsaw. Microscopic slides as well as serum samples for specific antibody detection are sent for approval of diagnosis to the a/m Institute and to the Institute of Maritime and Tropical Medicine in Gdansk. As a member of TropNetEurop, the author of this abstract collects and sends unified epidemiological questionnaires regarding imported malaria cases in Poland to the coordinator in Munich on a quarterly basis. Such a strategy is very helpful in exchanging a broad scope of information concerning epidemiology, prophylactic measures, the clinical picture, and the efficiency of the treatment of imported malaria cases. Over the past five years, the average annual number of imported malaria cases in Poland has been 40, with an additional 120 or so cases treated abroad. Each year, the Gdynia Institute prepares and dispatches to public health services updated data on regional-specific prophylactic measures according to WHO instructions.

4.13 **Slovakia,** O. Bálint and M. Avdičová

The history of malaria in Slovakia in the 20th and 21st century can be divided into three distinctive periods: the first, from 1920–1950, the period of autochthonous malaria; the second, from 1950–1990, the period of imported malaria (over 70 cases); and the third, from 1991–2002, which reflects changing features of imported malaria.

Autochthonous malaria was epidemic in eastern Slovakia, and even cases of *P. falciparum* malaria were seen; and sporadic cases were recorded in the southern part of Slovakia, mainly in the basin of the river Danube.

The country recognized at the time as Czechoslovakia was declared malaria free in 1962. During the period 1950–1990, more than 70 cases of imported malaria were reported. Fifty-four of the cases were hospitalized and details of 54 of the patients between the ages of 12 and 62 were analysed. The causative agent was *P. falciparum* in 31 cases, *P. vivax* in 22 cases, and *P. malariae* in two cases; while the diagnosis was uncertain in 2 cases. The total number of cases reached 57, and in 3 cases, dual infections were discovered. Difficulties in diagnosis were caused by the administration of anti-malarial drugs in 12 patients, during the early stages of the infection, the presence of associated diseases (10), mixed infections (3), an atypical course in semi-immune persons and, quite often, a failure to take the traveller's history. The patients were referred to the hospital with a number of different diagnoses: Tonsillopharyngitis (16), a febrile state (16), virus infection (10), Icterus (2), Bronchopneumonia (2), and with suspected malaria (15). Malaria was manifested within 2-5 days (8), 8 days and 30 months (45), and 3 years (1) after entering Slovakia. Through 1965–1989, strict health control measures were imposed on travellers entering or leaving the country for various reasons including business and tourism.

In 1990, a change in the nature of imported malaria was seen in Slovakia. This included the first detection of *P. falciparum* resistant or even multi-resistant to the classical antimalarial drugs, including the failure of chemoprophylaxis with chloroquine. Unfortunately, by this time, the health control of travellers was no longer carried out. There is no review available on the incidence among migrants, individual tourists, or illegal migrants. Travellers to malaria endemic countries have lost confidence in chemoprophylaxis.

The changed features of imported malaria over the past decade is reflected by an analysis of 35 of the imported malaria cases notified since 1990. Of these cases, 20 patients were hospitalized

within the age range of 12–60, (with a median age of 28 years). There were only 3 foreigners. The causative agents were *P. falciparum* in 14 cases, *P. vivax* in 7 instances, and mixed infections in one instance. In most cases the infection was acquired in Africa. The course of the disease was very severe in 6 cases, which were treated in ICUs. One patient died of *P. falciparum* infection. The cases occurred as a result of failures in prophylactic measures and the occurrence of serious *P. vivax* infections in 5 people taking plasmoquine as chemoprophylaxis (in Ethiopia).

The officials of Slovakia are well aware of the threat of the possible reintroduction of autochthonous malaria into the country. The importation of malaria is thoroughly monitored both clinically and parasitologically, and the presence of *Anopheles* (and other) mosquitoes is frequently surveyed. The question of what drugs should be recommended for malaria chemoprophylaxis is of much concern to the medical community in the country.

4.14 **Romania,** D. Nicolaiciuc

In 1955, WHO established a programme for the worldwide eradication of malaria. Romania was involved in these efforts, with spectacular results. In 1967, the WHO expert committee on malaria recommended Romania for inclusion in the official register of countries in which malaria had been eradicated. From this time onwards, Romania has remained in a phase of maintenance.

A mandatory reporting system regarding malaria has been established by an Order of the Minister of Health (Order no.8/2000 of the Minister of Health regarding operative information in issues related to epidemiology and hygiene). All malaria cases are reported to the Ministry of Health via the local Public Health Directorates not later than 24 hours following the hospitalization of the patient.

Preventive and curative malarial activities are set out by the Romanian Ministry of Health in the Order of the Minister of Health (2427/13.11.1996) regarding the establishment of principal technical measures in order to maintain malaria eradication in our country.

No autochthonous cases of malaria have been reported; and the cases recorded have been found in Romanians who have travelled to different malaria endemic regions of the world.

In light of the above, it is easy to conclude that all malaria cases in Romania are imported. This is due to a lack of or inadequate chemoprophylaxis administered to travellers either beforehand or at the time of their travel in infected areas. For this reason, the Romanian Ministry of Health and Family states that malaria does not currently represent a real public health problem in the country.

Between 1990 and 2001, a total number of 341 malaria cases, with 6 deaths, were reported amongst the population of Romania. In about 78% of the cases, the etiological agent was recognized as *P. falciparum*, while 20% of cases were due to *P. vivax*. Africa remains the most important endemic region from which malaria cases are imported to the population of Romania.

4.15 **Russian Federation,** A. Baranova

The malaria situation in the Russian Federation has worsened since 1996, when the importation of malaria from NIS countries increased. The tendency of growth in terms of both imported and

local transmission has continued in succeeding years. In 2001, the total number of malaria cases increased by 10% to a total of 898 cases. Of these, 764 were imported, while 134 were indigenous, occurring in 17 administrative territories of the country.

Most imported cases of *Plasmodium vivax* are seen in patients from Azerbaijan (29,4%) and Tajikistan (67,3%), who are for the most part seasonal workers and merchants. Deaths as result of severe tropical malaria totaled four in 2000, while in 2001, three fatal cases were registered (two Russian citizens infected in Sierra-Leone, and one Azeri child infected in Iran and succumbing to the disease in Voronezh, Russia). Local transmission has again occurred and the vectors are *An. messeae* and *An. maculipennis* in the suburbs and outskirts of cities, as well as in the areas of summer houses. The greatest number of such cases (94) was reported in August 2001 in Moscow and the Moscow region.

The malaria surveillance system in Russia is effective in that it prevents epidemics during the transmission season. Anti-malarial measures in potential and active foci consist of active screening of malaria patients, insecticide spraying of houses by synthetic pyrethroids, larviciding of groundwater, health education, and the training of medical personnel.

4.16 **Ukraine,** T.N. Pavlikovskaya

Malaria was eradicated from Ukraine in 1956. Since then the cases registered have been mostly imported. Over the past three years, 317 cases of malaria from 24 countries and 4 NIS nations have been imported, 46.7% of which occurred in Ukrainian citizens, and 53.3% amongst foreign citizens. *Plasmodium vivax* comprised 45.7% of all cases imported. Five fatal cases of *P. falciparum* were recorded. In both 1999 and 2001, one case of malaria by local transmission was reported. Surveillance of malaria in the country is carried out by a system developed by scholars and practitioners from our native land under the leadership of P.G. Sergeev, and then carried out with the goal of eradicating malaria as a widespread illness within the Soviet Union. The climatic and geographical features of the country, its abundant water resources, and the increase in imported malaria into the country, along with a lack of ecologically safe means to combat malaria vectors and a lack of essential medicines for treatment and chemo-prophylaxis, as well as socio-economic difficulties, all complicate the malaria situation and allow one to consider Ukraine, a territory with a high risk towards the return of malaria transmission.

4.17 **Yugoslavia,** M. Zgomba, D. Petric, A. Cupina and R. Dmitrovic

Malaria was eradicated throughout the whole territory of the former Yugoslavia following the Second World War. However, a fluctuating number of imported malaria cases have been detected every year in Serbia. Furthermore, autochthonous malaria has been registered several times; in 1955, more than 30 cases were reported, with the last case occurring in 1964. In the period 1990–2001, 158 imported cases were reported, arising mainly from endemic Afro-Asian regions. Therefore, records concerning the abundance and distribution of anopheline mosquitoes as potential vectors of malaria are extremely important.

Out of 11 *Anopheles* species (*An. algeriensis, An. atroparvus, An. claviger, An. hyrcanus, An. labranchiae, An. maculipennis, An. messae, An. plumbeus, An. sacharovi, An. subalpinus* and *An. superpictus*) recorded throughout the former territories of the country, six anopheline species are abundant in Vojvodina, formerly an area of endemic malaria in Serbia. Three of the species, including *An. plumbeus, An. claviger* and *An. hyrcanus*, proved rare to extremely rare in areas

examined for spatial distribution. *An messae* was by far the most abundant and predominant species in the alluvial plain of the Danube, Sava and the Tisa river. This is in close agreement with the records concerning the distribution of the species in Hungary and Romania. *An. atroparvus* was estimated as a common and in many instances predominant species at the sites characterized by saline and alkaline soils located near the lowlands of the river Tisa and in Banat. The three species of the *Anopheles Maculipennis* Complex, particularly *An. messae* and *An. atroparvus*, are of concern as potential vectors of malaria in Vojvodina.

Within a current study of the distribution of *Anopheles* species, their seasonal activity and abundance will be brought to light. Additionally, the results of the records of malaria cases occurring over the last 12 years will reveal the most prevalent parasites causing malaria, as well as the range in age of the patients.

5. Working groups

Following the conclusion of the country presentations, participants divided into three working groups.

Group 1 was requested to consider:

- Strategies, approaches and mechanisms for more effective sub-regional and country surveillance; and
- The character of WHO's technical guidance and coordination of malaria surveillance activities.

Group 2 was requested to consider:

- Modalities for ensuring the regular exchange of information on malaria prevention and control; and
- The possible creation of an inter-country working group composed of national counterparts and WHO personnel to ensure coordination of issues on malaria surveillance and prevention.

Group 3 was requested to consider:

- Recommendations for WHO and Member States; and
- Recommendations for Member States.

6. Conclusions

The following conclusions are based on the recommendations of the three working groups which were presented to and approved by the participants in plenary session:

The participants of the meeting welcomed the initiative of the Roll Back Malaria programme of WHO Regional Office for Europe in organizing and conducting the meeting and considered that it was of great value for the exchange of information on malaria surveillance programmes and plans for control and prevention.

The participating countries considered that in light of the continued importation of malaria cases, effective malaria surveillance is of the utmost importance so as to prevent the re-establishment of transmission in central and eastern Europe and bordering Newly Independent States.

As there is a continuing threat of the re-establishment of malaria transmission, the countries decided that all necessary steps should be taken to strengthen surveillance at the country and inter-country levels.

In light of the favourable past experience, the representatives of the countries of central and eastern Europe and bordering Newly Independent States requested that WHO continue to take the lead in the provision of technical guidance and coordination of malaria surveillance activities.

7. Recommendations

The following recommendations are based upon those formulated by the working groups and subsequently adapted and approved by the participants in plenary session:

7.1 Recommendations for WHO

It was recommended for WHO:

- To assist in the streamlining of the mechanisms to make sub-regional and country surveillance more effective and more appropriate to the conditions and needs of each country;
- To improve the regular exchange of information between the participating countries and WHO. It was suggested that a periodic Roll Back Malaria newsletter be issued by WHO;
- To arrange for similar meetings to be held in the future, as such exchanges of information are valuable in coordinating actions on the prevention of the re-emergence of malaria in member countries;
- To inform countries of the procedures that must be followed to access resources for the support of malaria prevention and control activities, including the newly established Global Fund for HIV/AIDS, tuberculosis and malaria. Countries should be assisted, where necessary, in the preparation of proposals for obtaining support;
- To provide more documentation concerning malaria in the Russian language for the countries of the NIS; and
- To offer training courses on malaria prevention and control for epidemiologists, entomologists, laboratory technicians and others involved in malaria surveillance in Belarus, Moldova and Ukraine.

7.2 Recommendations for Member States

It was recommended for Member States:

- To implement an assessment of their national malaria surveillance systems to identify any weaknesses or needs;

- Offer training for entomologists and entomological technicians, with special reference to the distribution, population densities and insecticide resistance of *Anopheles* vectors of malaria;
- To carry out insecticide susceptibility studies on potential *Anopheles* vectors of malaria;
- To ensure that technically sound and evidence-based national strategies and plans for malaria surveillance and prevention are developed, allowing for the rapid detection of abnormal malaria situations; and
- To ensure that stocks of insecticides and chemo-prophylactic and chemotherapeutic drugs are available for use for the rapid control of any outbreaks of malaria.

7.3 Recommendations for Member States and WHO

It was recommended for Member States and WHO:

- To ensure that the collection of malaria surveillance data is carried out in accordance with WHO standards, and that relevant information is regularly shared with WHO. This should include data on the incidence of malaria, local transmission vs. imported cases, and the distribution of malaria vectors;
- To ensure that WHO is immediately notified of any abnormal malaria situation and that emergency measures are undertaken where necessary; and
- To endeavor to bring greater awareness of the importance of malaria and extent of the risk of its re-emergence to national governments, health services and local authorities.

Annex 1

PROGRAMME

Monday, 24 June 2002

09.00–09.30	Registration
09.30–09.40	Welcome address *Minister of Health, Bulgaria*
09.40–10.00	Welcome address *RBM, WHO Regional Office for Europe*
10.00–10.30	*Coffee break*
10.30–10.45	Objectives of the meeting Appointment of Chairperson, Vice-Chairperson(s) and Rapporteur *RBM, WHO Regional Office for Europe*
10.45–11.00	World update on Roll Back Malaria *RBM, WHO Regional Office for Europe*
11.00–11.15	Progress with RBM in the WHO European Region *Mikhail Ejov, WHO Regional Office for Europe*
11.15–11.30	Progress with RBM in the WHO Eastern Mediterranean Region *Hoda Atta, WHO Regional Office for the Eastern Mediterranean*
11.30–11.45	Discussion
11.45–12.00	Imported malaria as a growing medical health problem in Europe *Pernille Jørgensen, WHO Regional Office for Europe*
12.00–12.15	Discussion
12.15–13.30	*Lunch break*
13.30–14.15	The vector-borne diseases in Europe aside from malaria *Norman Gratz*
14.15–14.25	The German Mosquito Control Association – a model for bio-rational mosquito control, *Paul Schädler*
14.25–14.45	Bio-rational control of nuisance and vector mosquitoes *Norbert Becker*
14.45–15.00	Discussion
15.00–15.30	*Coffee break*

15.30–16.00	Lessons learnt, progress and challenges with RBM in malaria-affected countries of the WHO European Region *Armenia and Tajikistan*
16.00–16.15	Discussion
16.15–17.00	Imported malaria and surveillance strategies applied *Albania, Bosnia & Herzegovina and Belarus*
17.00–17.30	Discussion

Tuesday, 25 June 2002

09.00–10.00	Imported malaria and surveillance strategies applied *Bulgaria, Croatia, Czech Republic and Greece*
10.00–10.15	Discussion
10.15–10.45	*Coffee break*
10.45–11.45	Imported malaria and surveillance strategies applied *Hungary, Republic of Moldova, Poland and Romania*
11.45–12.00	*Discussion*
12.00–13.30	*Lunch*
13.30–14.45	Imported malaria and surveillance strategies applied *Russian Federation, Slovak Republic, Former Yugoslav Republic of Macedonia, Ukraine and Yugoslavia*
14.45–15.00	Discussion
15.00–15.30	*Coffee break*
15.30–15.45	Guidelines for working group discussions *RBM, WHO Regional Office for Europe*
15.45–17.30	Working groups

Wednesday, 26 June 2002

09.00–11.00	Continuation of working groups Drafting of group recommendations
11.00–11.30	*Coffee break*
11.30–12.00	Presentation from working groups
12.00–12.30	Discussion on recommendations
12.30–13.00	Closure of the meeting

Annex 2

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