



RAPID RISK ASSESSMENT

Update on autochthonous *Plasmodium vivax* malaria in Greece

11 October 2011

Main conclusions and recommendations

Greece has reported thirty-six cases of *Plasmodium vivax* infection in 2011 to date, 20 of which have been in Greek citizens without travel history to an endemic country. Over eighty percent of these cases are associated with the area around Evrotas, located in Lakonia, in the Peloponnese region of southern Greece. This area (and four others currently reporting malaria cases) is agricultural and not usually associated with tourism. The ECDC risk, as assessed on 23 August 2011, remains unchanged. The main risk is to persons residing in, visiting and working in the affected areas of Greece, particularly Evrotas in Lakonia. The risk for further extension of malaria transmission into the EU as a result of this event is considered low at present. EU national blood competent authorities should be considering whether to implement deferral measures for persons returning from these specific affected areas in Greece, taking into consideration measures currently implemented by the Greek blood safety authorities and after a considered risk assessment in collaboration with their national public health authorities.

Source and date of request

Cases of autochthonous malaria due to *Plasmodium vivax* reported in Greece.

Source of assessment request and experts consulted

This updated rapid risk assessment was undertaken following an internal decision at ECDC.

ECDC would like to thank the following external organisations who were consulted for this assessment update:
Department of Surveillance and Intervention of the Hellenic Centre for Disease Control and Prevention (CDC),
National School of Public Health, Greece and the World Health Organization (WHO).

Errata

In the Rapid Risk Assessment 'Update on autochthonous *Plasmodium vivax* malaria in Greece' dated 5 October 2011, ECDC incorrectly referred to the distribution of malaria cases in Greek citizens and migrant workers. The correct formulation is: 'Greece has reported thirty-six cases of *Plasmodium vivax* infection in 2011 to date, 20 of which have been in Greek citizens without travel to an endemic country.' This was corrected on 11 October 2011.

On 30 October 2012, page 2 was amended to remove an erroneous reference to a figure 2, which had not been included in the report.

Disease background information

Plasmodium vivax is one of the five main *Plasmodium* species that cause human malaria (*P. vivax*, *P. falciparum*, *P. malariae*, *P. ovale* and *P. knowlesi*). All are transmitted through the bite of female *Anopheles* mosquitoes.

The main symptoms of malaria are cyclical fever and chills, headache, weakness, vomiting and diarrhoea. The most common complication is enlargement of the spleen. The incubation period for *P. vivax* usually ranges from 10 to 21 days, but can be up to a year. Unlike *P. falciparum* malaria, *P. vivax* malaria is rarely fatal. However, *P. vivax* relapses often occur months or even years after treatment due to the fact that the parasites can develop dormant forms (hypnozoites) in the liver. Relapses are not prevented by current chemo-prophylactic regimens, with the exception of primaquine, which should always be added to treatment regimens to eradicate dormant liver forms.

Among the five *Plasmodium* species, *P. vivax* has the widest global distribution. Nevertheless, this parasite is not endemic in EU and EEA/EFTA countries. Between 2006 and 2009, the confirmed rate of malaria cases in EU and EEA/EFTA countries remained stable at around one per 100 000 population. Of those cases for whom the relevant information was available, 99.5% were imported [1]. Within the WHO European Region, autochthonous *P. vivax* infections are regularly reported (e.g. from eastern Turkey), although this trend is decreasing. In Spain, a case of autochthonous malaria (*P. vivax*) was also reported from the Aragon region in 2010 [2].

Autochthonous cases of malaria in Greece have previously been reported in 1999 and 2000 [3][4]. Following several years with no reports, six cases of autochthonous malaria were reported in 2009 (through the European Surveillance System – TESSy 2009) and one in 2010, all residing in the same area of Evrotas, Lakonia, in the Peloponnese region of southern Greece [5]. The 2009 cases were associated with two imported cases of *P. vivax* from Pakistan and Afghanistan occurring during the summer in Evrotas. All reported cases made a full recovery.

It is known that mosquito vectors for malaria are present in Greece. In the Peloponnese region, the following species have been identified: *A. maculipennis s.s.*, *A. sacharovi*, *A. hyrcanus* and *A. superpictus* [6]. *A. sacharovi* is commonly found from May to September in wetlands and rice paddies, with the highest numbers of adult mosquitoes being observed in July.

Event background information

So far in 2011 (up to 26 September), 36 cases of *P. vivax* malaria have been reported to the Hellenic Centre for Disease Control and Prevention, and these cases are potentially autochthonous. Of the 36 cases reported, 20 occurred in Greek citizens with no travel history to a malaria endemic country. The other 16 cases were in migrant workers from Pakistan (the vast majority), Afghanistan and Morocco.

Figure 1 indicates the geographical area of residence associated with these potentially autochthonous cases.

Over 80% (30 cases) are reported to live around Evrotas, in the Prefecture of Lakonia, situated in the Peloponnese region of southern Greece. This is the same small geographical area where eight confirmed cases of *P. vivax* malaria occurred between August and October 2009 (two imported cases and six autochthonous cases) and one case in 2010. The area is largely farm land covered with citrus trees. The vast majority of farm workers are migrants from malaria-endemic areas of Asia and the Indian subcontinent, especially during the cropping season. It is reported that approximately 2 000–4 000 migrants currently live and work in the area of Skala, Lakonia and that there is a rapid turnover in their population.

One case is reported to have died; a man over 70 years of age who had severe underlying medical conditions.

In addition to Lakonia, four other prefectures have reported autochthonous malaria cases in Greek citizens in 2011; two cases in Evoia, two in Attiki, one in Larissa and one in Viotia. All the affected areas are non-touristic, agricultural areas in close proximity to wetlands.

The first case reported disease onset on 23 May 2011 and, in the most recently reported case, disease onset occurred on 21 September 2011. The overall gender distribution among the confirmed cases is 29 males and seven females. The age distribution among reported cases ranges between 1.5 and 79 years.

Figure 1. Geographic area of residence in Greece of *P. vivax* malaria cases without travel history to an endemic country, as of 26 September 2011



Source: Hellenic CDC

In addition, two Romanians are reported to have been diagnosed with *P. vivax* infection following their return to Romania after working and residing in the area of Skala, Lakonia.

Control measures implemented by the Hellenic CDC include enhancing surveillance in the affected areas (those areas reporting cases) to rapidly identify cases; informing health care professionals about early malaria diagnosis and treatment; raising public awareness and improving blood safety. Blood safety measures implemented by Greece in the affected areas include:

- Suspension of blood donation sessions in the affected areas and surrounding agricultural villages within a radius of 10 km for a period of six months. (This distance criterion is based on the mosquito's flying capacity which is estimated to be about five kilometres).
- Temporary deferral of blood donation from asymptomatic persons residing or working in the affected areas for a period of six months.
- Temporary ban on blood donation from Greek citizens with family history of malaria.
- To prevent a negative impact on the blood supply, blood units collected in the affected areas of Lakonia and East Attica are being PCR tested in cooperation with the National School of Public Health's Reference Laboratory for Parasitic Diseases.

Up until 22 September 2011, no positive blood unit had been detected.

Entomological investigations in 2009 revealed the presence of *A. sacharovi* in the area of Evrotas. In June 2011, adult *Anopheles* spp. mosquitoes were not identified in CO₂ and light traps, although a limited number of *Anopheles* larvae were found in the wetlands. In August 2011, a small number of adult *Anopheles* mosquitoes were collected using the same methods and identified as *Anopheles sacharovi*.

Intensified mosquito control measures have also been introduced by the local authorities.

ECDC threat assessment for the EU

Greece was historically malaria-endemic until national eradication programmes allowed the country to achieve malaria-free status in 1974. This is now the third consecutive year in which autochthonous cases have been reported in the country. The six cases reported in 2009 and thirty cases reported in 2011 are from the same geographic area of Evrotas, Lakonia. A further four Greek prefectures have reported autochthonous malaria cases in Greek citizens in 2011.

The transmission of *P. vivax* malaria in the Skala area, Evrotas may result from several mechanisms and, on the basis of the information available, it is not possible to ascertain which is responsible.

These mechanisms are:

- Introduction of malaria every year by migrants originating from malaria-endemic countries, resulting in subsequent onward transmission to nearby residents by local mosquito vectors;
- Overwintering of parasite in local mosquito vectors, resulting in subsequent onward transmission to nearby residents by local mosquito vectors;
- Established human reservoirs of *P. vivax* in these areas following introduction in previous years, resulting (through relapses) in subsequent onward transmission to nearby residents by local mosquito vectors.

However, the increased number of autochthonous cases reported this year would indicate that conditions (vector and population) can be considered favourable for sustained local transmission in the affected areas, especially Evrotas in Lakonia, despite intensive intervention efforts for vector control.

The main risk related to the current event is to persons residing, visiting and working in the affected areas of Greece, particularly that of Evrotas, Lakonia. As the risk for malaria in Greece is still considered very limited and intervention measures are ongoing in the affected areas, a general recommendation for travellers to take prophylaxis is not advised at this date. However, standard measures should be taken to prevent mosquito bites.

As the mosquito season for 2011 has not yet come to end, additional cases of *P. vivax* may yet be diagnosed and reported from the five affected areas. Such cases may occur among residents, but also among people visiting or working in these areas from EU and non-EU countries.

National authorities responsible for blood safety in EU Member States that may be considering whether to implement deferral measures [7] for persons returning from the affected areas in Greece should take into consideration the measures currently being implemented by the Greek blood safety authorities, and conduct a risk assessment for travellers returning from these areas in collaboration with their national public health authorities.

The current malaria situation in Greece represents a very limited risk of spread to the rest of the European Union, compared to that of travellers returning from other malaria-affected countries worldwide. However, it is important that health practitioners in other Member States include malaria infection in the differential diagnosis in symptomatic persons returning from these areas in Greece.

It is unlikely that autochthonous transmission of malaria will re-establish itself in wider continental Europe, as it is dependent upon mosquito distribution and abundance; vectorial capacity and vector competence of the mosquitoes, and the introduction of the parasite through travel by carriers of *Plasmodium* spp. gametocytes. Some of these factors depend on climate and environment and, although as yet no changes in species distribution of anopheline mosquitoes related to climate change have been observed in the EU, this factor cannot be excluded in the future. For this reason, it is important to continue closely monitoring the situation in areas of the European Union where *Anopheles* mosquito populations are present and to increase awareness among clinicians. This will ensure that suspected malaria cases are rapidly identified and reported to the respective authorities, giving rise to an appropriate public health response.

Conclusions

The current epidemiological and entomological evidence in Greece shows that local transmission of malaria is possible in different areas in Greece. However, the majority of reported cases are confined to a delimited geographical area in the delta of the Evrotas River in the Lakonia Prefecture of the Peloponnese, in southern Greece. The main risk is to persons residing, visiting and working in the affected areas of Greece, particularly that of Evrotas, Lakonia. All areas from which malaria cases are currently being reported are agricultural rather than touristic and located close to wetlands.

The 2011 mosquito season has not yet come to an end and therefore it is possible that new cases might occur among residents and persons visiting or working in the affected areas, especially Evrotas, Lakonia.

The risk for further extension of malaria transmission into the European Union in relation to this event is considered low at present.

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