Detection on four continents of dengue fever cases related to an ongoing outbreak in Luanda, Angola, March to May 2013

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Citation style for this article:
Schwartz E, Meltzer E, Mendelson M, Tooke A, Steiner F, Gautret P, Friedrich-Jaenicke B, Libman M, Bin H, Wilder-Smith A, Gubler DJ, Freedman DO, Parola P. Detection on four continents of dengue fever cases related to an ongoing outbreak in Luanda, Angola, March to May 2013 . Euro Surveill. 2013;18(21):pii=20488. Available online: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=20488
Euro Surveill. 2011;16(22):pii=19883. Available online: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=19883

Article submitted on 14 May 2013 / published on 23 May 2013

In April 2013, ten cases of dengue fever in travellers returning from Luanda, Angola, to five countries on four continents, were reported to the globally distributed GeoSentinel Surveillance network. Dengue virus serotype 1 was identified in two cases. The findings indicate that a major dengue outbreak is currently ongoing in Luanda. This report illustrates how cases from an emerging arboviral epidemic focus can spread internationally and highlights the risk of dissemination of a vector-borne disease into receptive areas.

GeoSentinel provides a sentinel sample of returning travellers at 56 clinics in 24 countries on six continents [1]. During April 2013, GeoSentinel sites in Canada, France, Germany, Israel and South Africa reported a total of 10 cases of dengue in business travellers returning from Angola, with Luanda as the only likely place of exposure. Meanwhile, on 15 April, the Instituto de Higiene e Medicina Tropical in Lisbon, Portugal reported 19 cases of dengue acquired in Luanda since late March 2013, in four of whom dengue virus (DENV)-1 was detected by polymerase chain reaction (PCR) [2]. The nearly simultaneous reports of dengue cases related to travel to Luanda from five GeoSentinel sites on four continents, as well as Portugal, suggest that a large scale outbreak of dengue may in fact be unfolding in Angola.

Background

In Angola, DENV activity has been reported sporadically. Early surveys in the 1960s revealed no evidence of DENV activity [3], while outbreaks of clinically suspected dengue in the 1970s were proven to be caused by chikungunya [4]. In the 1980s an outbreak of dengue was reported from Luanda, with subsequent reports of travel-related dengue acquired in Angola, by travellers from the Netherlands [5] and Brazil [6]. For a Brazilian travel-related case, the serotype identified was DENV-2. Since then, there has been little information on the risk of dengue in Angola. This may represent an absence of disease activity, or a lack of awareness, diagnostic resources and active surveillance.

Travellers may serve as sentinels to local epidemic risks, and this role is especially important in areas with scarce public health reporting and resources. Thus, cases of dengue among European travellers returning from the Comoros islands in east Africa [7] and Benin in west Africa [8] have called attention to local DENV transmission. In a recent review, 12 of 27 countries in Africa where travellers/expatriates had acquired dengue, had not reported local DENV transmission [9].

Here, we report on an apparent outbreak of dengue in Luanda, Angola diagnosed among travellers presenting to travel clinics on four continents.

Table

Travel-related dengue infections acquired in Luanda, Angola, reported from GeoSentinel sites, March–May 2013 (n=10)

Country of origin of the case	Fever onset date	Time from fever onset to test (days)	NS1	Serology-IgM	Qt-PCR
Germany	30 March	4	Positive	Positive	ND
Canada	3 April	10	Negative	Positive	ND
France	5 April	12	Negative	Positive	Negative
Germany	7 April	14	Negative	Positive	ND
South Africa	10 April	7	ND	Positive	Negative
Israel	11 April	14	ND	Positive	ND
Israel	17 April	7	Positive	Positive	ND
Israel	18 April	4	Positive	Positive	DENV-1
Israel	25 April	5	Positive	Positive	DENV-1
Israel	2 May	6	Positive	Positive	ND

DENV: dengue virus; NS1: non-structural protein 1; ND: not done; Qt PCR: quantitative polymerase chain reaction.

Case descriptions

Overall the male/female ratio of cases reported to GeoSentinel was 9:1 and the traveller's age was 41.3±10.7 (mean ±SD) years.

All cases presented with an acute febrile illness and symptoms suggestive of classic dengue, including headache and joint pain. In three of the 10 cases a rash was reported. Laboratory studies during the febrile period revealed leucopenia (range: 1.2–2.9 x 10^9/L, norm: 4.0–10.0 x 10^9/L) and thrombocytopenia (range: 13–124 x 10^9/L, norm: 140–440 x 10^9/L) in all the cases. None of the cases had features of severe dengue and all recovered without complications.

Dengue diagnosis was confirmed by one or more of three methods; non-structural protein 1 (NS1) antigen, DENV IgM enzyme-linked immunosorbent assay (ELISA) serology or DENV viraemia by quantitative (Qt)-PCR (Table). DENV IgM was detected in all 10 cases, whereas five cases also tested positive for NS1 antigen. For all these latter cases except one from Germany (Table), NS1 antigen and DENV IgM were detected in a single sample. For the German case, a blood sample drawn at four days post symptom onset was NS1 antigen positive but seroconversion was verified in subsequent samples. In two viraemic Israeli patients, Qt-PCR revealed the virus to be DENV-1 similar to the imported cases seen in Portugal [2].

Discussion

Dengue has long been known to exist in Africa, but its epidemiology is poorly documented. Recent prediction models of dengue suggest that the true burden of dengue in Africa may approach that of South America [10]. Moreover, limited serological surveys in locations such as Burkina Faso [11] have suggested that the disease is far more prevalent than previously recognised. In the last four years, large dengue epidemics were reported on Macaronesian islands of Cape Verde (DENV-3) [12] and Madeira (DENV-1) [13] off the northwest African coast. Common models of dengue epidemiology suggest that clinically diagnosed cases of classic dengue represent the tip of an iceberg, with actual case numbers being much higher [14].

On 1 April 2013 local health authorities in Luanda reported six cases of dengue fever acquired in the city [15]. The true extent of the dengue outbreak in Luanda is likely to be much higher than currently acknowledged. Anecdotally, returning Israeli travellers with dengue have maintained that multiple additional cases of similar febrile illness were extant in the expatriate community in Luanda.

The origin of the present DENV-1 strain responsible for the current Luanda outbreak is as yet undetermined, but the possibility of an imported strain is of concern. Of the 190,000 ill returned travellers in the GeoSentinel database since 1997, no previous cases of dengue acquired in Angola have been reported. Strains of DENV appear to be circulating between east Africa and the Indian subcontinent [16] and recent DENV-1 isolates from Madeira appear to be closely related to strains circulating in Central or South America [17,18]. Thus, it is well established that dissemination of dengue from DENV endemic countries in America and Asia occurs both in east Africa and off the northwest African coast. In this regard, it is important to note that according to the World Tourism Organization (WTO) data, major source countries of travellers to Angola included DENV

endemic China and Brazil, with 69,900 and 29,700 travellers respectively during 2011 [19].

Another source of concern is the possibility of the spread of dengue to susceptible countries by returning, viraemic travellers. *Aedes albopictus*, one of the DENV vectors is currently endemic throughout most of the Mediterranean basin, and has recently been documented as far north as the Netherlands [20]. In Israel for example, the presence of *Aedes albopictus* in dense population centres, creates prime conditions for a dengue outbreak [21].

At present, health practitioners should be aware of the possibility of dengue in febrile travellers returning from Angola. Such travellers would be best served by clinicians with access to rapid diagnostic tests, and should be advised to implement measures to avoid mosquito bites, for the likely duration of viraemia.

This report serves to illustrate the possible speed of global dissemination of cases from an emerging arboviral epidemic focus, and the potential for introduction of novel viruses or novel strains into receptive countries.

Authors' contributions

Eli Schwartz – study conception; Eyal Meltzer – Drafting of the article; Marc Mendelson – Critical review and editing of the manuscript; Alan Tooke – Collection of data; Florian Steiner – Critical review and editing of the manuscript, collection of data; Philippe Gautret – Critical review and editing of the manuscript, collection of data; Barbara Friedrich-Jaenicke – Collection of data; Michael Libman – Critical review and editing of the manuscript, epidemiological data; Hanna Bin – Laboratory analysis; Annelies Wilder-Smith – Critical review and editing of the manuscript; Duane J Gubler – Laboratory analysis, critical review and editing of the manuscript; David O. Freedman – draft editing, and patient classification; Philippe Parola – Critical review and editing of the manuscript. David O. Freedman and Philippe Parola, also linked the cases together using the GeoSentinel system.

Conflict of interest

None declared.

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