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Review

Sandfly-borne phleboviruses of Eurasia and Africa: Epidemiology, genetic diversity, geographic range, control measures ☆

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ABSTRACT

Sandfly-borne phleboviruses may cause a transient febrile illness (sandfly fever) or more severe neuroinvasive disease. In the Old World, they are vectored by phlebotomine flies, which are widely distributed in the Mediterranean basin, North Africa, the Indian subcontinent, the Middle East and central Asia. High seroprevalence rates have been recorded in humans and domestic animals in areas where sandflies are present. Most published studies have focused on phlebovirus infections of travelers and of soldiers stationed in endemic areas, but the health impact on local populations should not be underestimated, as seroprevalence studies indicate massive circulation of these viruses, even if disease is seldom documented. Except for Toscana virus, which shows a marked neurotropism and is a leading cause of aseptic meningitis in endemic regions, phlebovirus infections are inadequately considered by physicians and are generally underestimated. However, several properties of these viruses suggest that they will extend their geographic range. First, changes in the areas occupied by sandflies as a result of climate change have a direct impact on the epidemiology of associated human and animal diseases. Second, phleboviruses exhibit a high mutation rate, and their tri-segmented genome is prone to reassortment and recombination. Third, distinct virus strains can be transmitted by the same arthropod species. Recent studies have documented the distribution of sandfly-borne phleboviruses in Western Europe, but data for Eastern Europe, the Middle East and Africa are very limited. With the goal of filling knowledge gaps and planning new research programs, we have examined available information and present it as a comprehensive review, with a specific focus on understudied regions. We also discuss the need to conduct studies aimed at developing new antiviral drugs and vaccines.

Contents

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1. Introduction

Sandfly-borne viruses belong to the genera *Phlebovirus* (family *Bunyaviridae*), *Vesiculovirus* (family *Rhabdoviridae*) and *Orbivirus* (family *Reoviridae*). In this review, we focus on phleboviruses transmitted by sandflies in Eurasia and Africa, which are associated with sandfly vectors that belong to the genus *Phlebotomus*. Sandfly-borne phleboviruses are widely distributed in the Mediterranean region, in Africa, the Indian subcontinent, the Middle East and central Asia.

Except for Toscana virus, which has a marked tropism for central and peripheral neurological systems, sandfly fevers cause moderately severe disease, and are often given little attention by physicians. There is also much less scientific interest in sandfly-transmitted viral diseases than in other arboviruses. For instance, a PubMed-based bibliographic search using "Toscana virus", "sandfly virus", and "sandfly fever virus" retrieved 232, 385, and 265 references, respectively, while searches with the keywords "West Nile virus" and "dengue virus" retrieved more than 4500 and 6000 papers. It is therefore difficult to provide accurate