in Italy and Spain (*1*,*9*). In southern European countries, TOSV is mostly transmitted by *P. perniciosus* and *P. perfiliewi* sandflies (*1,6,9*), whereas *P. perniciosus*, *P. longicuspis*, and *P. perfiliewi* are the most abundant sandfly species in northern Tunisia. It is therefore probable that TOSV is transmitted by sandfly species of the subgenus *Larroussius*.

We found that 2 phleboviruses belonging to the *Sandfly fever Naples virus* species, TOSV and Punique virus, are cocirculating in northern Tunisia. This finding calls for further investigation of these viruses' potential effect on human health in this area.

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References

1. Verani P, Ciulfolini MG, Caciolli S, Renzi A, Nicoletti L, Sabatinelli G, et al. Ecology of viruses isolated from sand flies on Italy and characterization of a new phlebovirus (Arbia virus). Am J Trop Med Hyg. 1988;38:433–9.
2. Charrel RN, Gallian P, Navarro-Mari JM, Nicoletti L, Papa A, Sánchez-Seco MP, et al. Emergence of Toscana virus in Europe. Emerg Infect Dis. 2005;11:1657–63. http://dx.doi.org/10.3201/eid1111.050869
3. Bahri O, Fazaa O, Ben Alaya-Bouafif N, Bouloy M, Triki H, Bouattour A. Role of Toscana virus in meningo-encephalitis in Tunisia [in French]. Pathol Biol (Paris). 2011;59:e125–7. Epub 2010 Apr 7.
4. Zhioua E, Moureau G, Chelbi I, Ninove L, Bichaud L, Derbali M, et al. Punique virus, a novel phlebovirus, related to sandfly fever Naples virus, isolated from sandflies collected in Tunisia. J Gen Virol. 2010;91:1275–83. http://dx.doi.org/10.1099/vir.0.019240-0
5. Sánchez-Seco MP, Echevarría JM, Hernández L, Estévez D, Navarro-Marí JM, Tenorio A. Detection and identification of Toscana and other phleboviruses by RT-nested-PCR assays with degenerated primers. J Med Virol. 2003;71:140–9. http://dx.doi.org/10.1002/jmv.10465
6. Charrel RN, Izri A, Temmam S, Delaunay P, Toga I, Dumon H, et al. Cocirculation of 2 genotypes of Toscana virus, southeastern France. Emerg Infect Dis. 2007;13:465–8. http://dx.doi.org/10.3201/eid1303.061086
7. Rothberg JM, Hinz W, Rearick TM, Schultz J, Mileski W, Davey M, et al. An integrated semiconductor device enabling non-optical genome sequencing. Nature. 2011;475:348–52 http://dx.doi.org/10.1038/nature10242.
8. Tamura K, Peterson D, Peterson N, Stecher G, Nei M, Kumar S. MEGA5: Molecular Evolutionary Genetics Analysis using maximum likelihood, evolutionary distance, and maximum parsimony methods. Mol Biol Evol. 2011;28:2731–9. Epub 2011 May 4. http://dx.doi.org/10.1093/molbev/msr121
9. Sanbonmatsu-Gámez S, Pérez-Ruiz M, Collao X, Sánchez-Seco MP, Morillas-Márquez F, de la Rosa-Fraile M, et al. Toscana virus in Spain. Emerg Infect Dis. 2005;11:1701–7. http://dx.doi.org/10.3201/eid1111.050851
10. Chelbi I, Derbali M, Al-Ahmadi Z, Zaafouri B, El Fahem A, Zhioua E. Phenology of *Phlebotomus papatasi* (Diptera: Psychodidae) relative to the seasonal prevalence of zoonotic cutaneous leishmaniasis in central Tunisia. J Med Entomol. 2007;44:385–8. http://dx.doi.org/10.1603/0022-2585(2007)44[385:POPPDP]2.0.CO;2

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Seroprevalence of Dengue in American Samoa, 2010

To the Editor: Since the 1970s, regular dengue epidemics have caused considerable illness in the Pacific region (*1*). In 2009, an epidemic year, the incidence of reported clinical dengue cases in American Samoa reached 644 cases/100,000 population; in 2010, incidence decreased to 77 cases/100,000 population (*2*). Dengue surveillance in American Samoa is being developed, but the effects of this disease are unknown.

In 2010, blood samples were collected in American Samoa primarily for a leptospirosis seroprevalence study. Samples were also tested for IgG antibodies against dengue virus, and a seroprevalence of 95.6% was observed. We report this finding and advocate improved surveillance and integrated control programs to limit dengue transmission in American Samoa.

A cross-sectional seroprevalence study was conducted during May–July 2010 with the primary aims of identifying risk factors for human leptospirosis and providing an evidence base to direct public health interventions in American Samoa (*3*,*4*). During the study, investigators encountered community concern about dengue and were asked by health authorities to use the remaining collected serum for a dengue seroprevalence study. Amendments to the original human research ethics applications submitted to the American Samoa Institutional Review Board and the University of Queensland

Medical Research Ethics Committee (2010000114) were approved.

From the general population of the islands of Tutuila, Aunu'u, and Manu'a, 807 adults were recruited. Households were selected from Tutuila and Aunu'u Islands by using a spatial sampling design to facilitate geospatial analysis (*4*). One adult from each household was asked to volunteer for the study. The small size of villages on the Manu'a Islands meant that spatial sampling was not possible; thus, a convenience sample of volunteers was recruited. A 5-mL blood sample was collected from each participant, information on demographics and risk exposures was obtained by using a standardized questionnaire, and each participant's primary place of residence was georeferenced.

In October 2011, serum samples from 794 participants 18–87 years of age (median age 39.5 years) were tested at the Australian Army Malaria Institute (Brisbane, Queensland, Australia) for IgG antibodies against dengue virus. Thirteen participants were excluded from the original sample of 807 because of insufficient serum. Samples were screened by using the PanBio Dengue IgG Indirect ELISA Kits (Inverness Medical Innovations, Brisbane, Queensland, Australia) following the manufacturer's recommendations and protocols. PanBio Dengue IgG Indirect ELISA Kits can detect antibodies to all 4 dengue virus serotypes with a sensitivity of 99.2% and a specificity of 96.2% (*5*). However, these kits cannot identify the specific dengue serotypes responsible for infections. Results were calculated as counts and proportions of PanBio Units (PBU) and allocated a dengue IgG status accordingly: <9.0 PBU was a negative result, 9.0–11.0 PBU was an equivocal result, and >11.0 PBU was a positive result.

Serum samples from 759 (95.6%, 95% CI 93.9%–96.8%) of 794 study participants had IgG antibodies against dengue virus (Table). Seroprevalence for men and women was comparable and did not differ from overall results. As expected, the seropositivity rate was lower among persons 18–25 years of age (89.1%, 95% CI 84.0%–92.6%) because of less time exposed to dengue viruses, and the seropositivity rate was higher among persons 26–40 years of age (99.5%, 95% CI 97.5%–99.9%) than for the overall study population. Despite this study being limited by convenience sampling on the Manu'a Islands, it demonstrates almost universal exposure of sampled adults in American Samoa to dengue viruses.

Table. Prevalence of IgG against dengue virus among 794 adults, American Samoa, 2010*

Characteristic	No. positive/no. tested	% Positive (95% CI)
Dengue IgG status		
Negative, PBU <9.0	29/794	3.6 (2.6–5.2)
Equivocal, PBU 9.0–11.0	6/794	0.8 (0.35–1.6)
Positive, PBU >11.0	759/794	95.6 (93.9–96.8)
Sex		
M	402/418	96.2 (93.9–97.6)
F	357/376	94.9 (92.2–96.7)
Age, y		
18–25	179/201	89.1 (84.0–92.6)
26–40	216/217	99.5 (97.5–99.9)
41–53	182/187	97.3 (93.9–98.8)
54–87	182/189	96.3 (92.6–98.2)
Total	NA	NA

*PBU, PanBio units; NA, not applicable.

In the absence of a vaccine, timely and accurate dengue surveillance and consequent public health response is imperative. Current dengue surveillance in American Samoa is passive and relies on clinicians reporting suspected cases to public health authorities. Passive surveillance systems are typically insensitive, and barriers to treatment seeking by residents (distance to health care facility, financial costs, and encouragement from health authorities to stay at home unless symptoms are severe) further reduces their efficiency (*6*). Moreover, passive surveillance systems do not capture asymptomatic infections, which contribute to disease transmission in the community during the viremic stage of illness. Development of an active surveillance system incorporating geographic information systems would enable health authorities to better monitor distribution and intensity of acute infections, identify high-risk areas, and target dengue control activities (*7*).

These preliminary findings should be evaluated by additional study. Further research into dengue seroprevalence in American Samoa should involve identifying dominant and circulating virus serotypes, studying vector population dynamics, investigating dengue exposure among children, exploring environmental risk factors, and integrating these data into active geographically enhanced surveillance systems. In addition, we suggest implementing a sustainable vector control program similar to those undertaken in Vietnam to limit dengue transmission and reduce associated illness in American Samoa (*8*).

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References

1. Singh N, Kiedrzynski T, Lepers C, Benyon EK. Dengue in the Pacific: an update of the current situation. Pac Health Dialog. 2005;12:111–9.
2. Arima Y, Matsui T. Epidemiologic update on the dengue situation in the western Pacific region, 2010. Western Pacific Surveillance and Response Journal. 2011;2: doi: 10.5365/wpsar.2011.2.2.005.
3. Lau CL, Dobson AJ, Smythe LD, Fearnley EJ, Skelly C, Clements AC, et al. Leptospirosis in American Samoa 2010: epidemiology, environmental drivers and the management of emergence. Am J Trop Med Hyg. 2012;86:309–19. http://dx.doi.org/10.4269/ajtmh.2012.11-0398
4. Lau CL, Clements AC, Skelly C, Dobson AJ, Symthe LD, Weinstein P. Leptosirosis in American Samoa: estimating and mapping risk using environmental data. PLoS Negl Trop Dis. 2012;6:e1669. Epub 2012 May 29.
5. McBride WJ, Mullner H, LaBrooy JT, Wronsky J. The 1993 dengue 2 epidemic in North Queensland: a serosurvey and comparison of hemagglutination inhibition with an ELISA. Am J Trop Med Hyg. 1998;59:457–61.
6. Ooi E, Gubler DJ, Nam VS. Dengue research needs related to surveillance and emergency response [cited 2012 Oct 2]. www.tropika.net/svc/review/061001-Dengue_Surveillance_and_emergency_response
7. Duncombe J, Clements A, Hu W, Weinstein P, Ritchie S, Espino FE. Geographical information systems for dengue surveillance. Am J Trop Med Hyg. 2012;86:753–5. http://dx.doi.org/10.4269/ajtmh.2012.11-0650
8. Kay B, Nam VS. New strategy against *Aedes aegypti* in Vietnam. Lancet. 2005;365:613–7.

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Delayed Diagnosis of Dirofilariasis and Complex Ocular Surgery, Russia

To the Editor: *Dirofilaria repens* is a vector-borne, zoonotic, filarial nematode that infects dogs, cats, and humans. In humans, *D. repens* worms cause subcutaneous dirofilariasis, characterized by the development of benign subcutaneous nodules that mimic skin carcinomas (*1*), and ocular dirofilariasis in orbital, eyelid, conjunctival, retroocular, and intraocular locations (*2*). Intraocular and retroocular dirofilariasis causes considerable damage and discomfort in patients from the presence of the worms and from their surgical removal (*3*). Here, we report a retroocular *D. repens* nematode infection in a patient in Russia that illustrates the difficulties in clinical management and the inherent risks of surgical procedures to remove the worms.

A 20-year-old woman living in Rostov-na-Donu in southwestern Russia who had never traveled outside the city sought ophthalmologic consultation for pain and skin redness and swelling in the inner corner of the upper left eyelid. Swelling migrated successively to the temporal area, the lower eyelid, and the inner corner of the lower eyelid. The patient had no other ocular signs or symptoms, and her general condition was otherwise good. Results of ophthalmologic examination and routine laboratory tests were within normal limits. Four days of treatment with cefotaxime resulted in the remission of signs and symptoms. Approximately 2 months later, swelling in the inner corner of the upper eyelid appeared again, affecting the whole upper eyelid, without itching or tenderness. Allergies were diagnosed; cetirizine was administered for 4 days, and the signs remitted at the third day of treatment. One month later, marked upper left eyelid swelling occurred, resulting in ptosis. Cetirizine was prescribed again; edema subsided after 4 days of treatment but relapsed in the following 3–4 days.

At least 4 subsequent relapses occurred; thus, a computed tomographic scan of the paranasal sinuses and orbits was performed, 4 months after signs and symptoms began (Figure, panel A). The scan detected a soft tissue structure, 12 × 13 × 14 mm, behind the left eyeball, adjacent to and medially dislodging the optic nerve. No other abnormalities were found in the visible area of the brain and sinuses. Magnetic resonance imaging (MRI) performed 1 month later (Figure, panel B) corroborated the presence of a cyst-like structure with an irregular, rounded shape and clear, smooth borders closely adhered to the eyeball and optic nerve. T2-weighted images showed that the lesion had a high-density core but the surrounding tissue was low density. Adjacent to the lesion, the retrobulbar tissue was slightly swollen, the optic nerve was displaced medially and downward, and the adjacent upper muscle was displaced medially and upward. The diagnosis was evidence of a retroocular cystic lesion in the left orbit with a well-defined capsule and high-density but heterogeneous core structure.

High-resolution ultrasound examination (Figure, panel C) revealed a well-defined, 3-mm, cyst-like wall containing fluid and dense, coiled-twisted linear internal structures that appeared to be actively moving (Video 1, Appendix, wwwnc.cdc.gov/EID/article/19/2/12-1388-V1.htm). Color Doppler examination (Figure, panel D; Video 2, Appendix, wwwnc.cdc.gov/EID/article/19/2/12-1388-V2.htm) revealed blood vessels in the wall but not inside the cystic structure. These additional examinations led to a diagnosis of a retroocular parasitic cyst in the left orbit, most likely a *Dirofilaria* spp. parasite. The parasitic cystic nodule was removed during a transpalpebral orbitotomy. A live, adult roundworm, 87 × 0.6 mm, was