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Background. Scrub typhus (ST) is endemic in Fukushima, where the highest number has been reported from 2006 to 2011 in Japan. Atypical clinical presentation of ST makes the diagnosis difficult followed by treatment delay. Despite fatal but treatable disease with early recognition, the myriad clinical features of ST have been underreported.

Methods. We reviewed the clinical features of adult patients diagnosed as ST from 2008 to 2017 at Ohita Nishinouchi General Hospital, a major teaching hospital in Fukushima, Japan.

Results. Total 55 cases (serotype Karp 24, Irie/Kawasaki 21, Hirano/Kuroki 10) of ST were confirmed by elevated specific IgM and IgG in the paired sera and real-time PCR analysis of eschars. Unusual presentations as the main clinical features of ST are found in 7/55 (13%; Karp 4 and Irie/Kawasaki 3), including cardiovascular (3 cases of paroxysmal atrial fibrillation), neurological (2 cases of syncope and one case of encephalitis) and metabolic/electrolyte disorder (one case of hypotremia). In terms of atypical clinical features, the cases without triad (fever ≥38.0°C, rash and eschar) were found in 14/55 (25%). The cases of “eschar negative scrub typhus” were found in 6/55 (11%; Karp 1, Irie/Kawasaki 2, Hirano/Kuroki 3). The cases without fever and rash were also found in 6/55 (11%; Karp 2, Irie/Kawasaki 3, Hirano/Kuroki 1) and 4/55 (7%; Karp 2, Irie/Kawasaki 1, Hirano/Kuroki 1), respectively. Severe cases (4/55, 7%) were found with shock and disseminated intravascular coagulation including one fatal case (1/55, 1.8%; Hirano/Kuroki). Besides more than half of ST cases with triad (38/55, 55%), unusual and atypical presentations were found in 38/55 (68%) with increase by age (P = 0.014) (Table 1), but there were no significant differences by sex (M: 8/37, F: 1/18, P = 0.19) or self-reported national origin using chi-squared tests. We then used multivariable logistic regression to examine predictors of (1) confirmed positive or (2) discordant screening and confirmatory testing. Confirmed positive cases were referred to the Pediatric and Adult Infectious Disease clinics at Boston Medical Center for further evaluation and treatment. We compared the proportion of confirmed positives by sex, age, and self-reported national origin using chi-squared tests.

Conclusion. The diagnosis of ST is a clinical challenge without typical features. In endemic area, unusual and atypical presentation of ST involving multi-system should be noted as the odds-on favorite differential diagnosis.

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This abstract has been withdrawn at the author’s request.

442. The Results of a Primary Care-based Screening Program for Trypanosoma cruzi in East Boston, Massachusetts
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Background. This study reports the outcomes of the Strong Hearts pilot project to integrate screening for Trypanosoma cruzi into a primary care setting and facilitate referral for treatment at East Boston Neighborhood Health Center.

Methods. Continuing education about Chagas disease was offered to healthcare providers, and community-based outreach was provided. One-time screening for all patients ≥50 years old who lived in Mexico, South or Central America for ≥6 months was recommended. The initial screening test was an ELISA performed by a commercial laboratory and confirmatory testing was performed at the US CDC. Confirmed positives were defined as positive on both the screening and confirmatory tests. Confirmed positive cases were referred to the Pediatric and Adult Infectious Disease clinics at Boston Medical Center for further evaluation and treatment. We computed the proportion of confirmed positives by sex, age, and self-reported national origin using chi-squared tests. We then used multivariable logistic regression to examine predictors of (1) confirmed positive or (2) discordant screening and confirmatory testing.

Results. A total of 2,183 screening tests were sent; 84 (3.8%) were positive, 2,082 (95.4%) negative, and 17 (0.8%) indeterminate. Among 73 tests with confirmatory results available, 19 (26%) were positive and 54 (74%) negative. All indeterminate tests were confirmed negative. The proportion of confirmed positives increased with increasing age (P = 0.014) (Table 1), but there were no significant differences by sex (M: 8/77, F: 1/11, P = 0.51) or self-reported national origin (P = 0.79). Nineteen confirmed positives have been evaluated and six initiated benznidazole to date. Three confirmed positives were pregnant. In multivariable models, there were no significant predictors of confirmed positive or discordant testing.

Conclusion. This pilot shows that integration of screening for Chagas disease is feasible in primary care. Although the prevalence of T. cruzi infection was higher in older age groups, there were no clear demographic predictors of a confirmed positive or discordant test. We also found a high false-positive rate of the screening test, highlighting the need for improved serologic testing options.

Table 1

| Age Group (Years) | Positive Cases (#) | Total Screened (#) | Prevalence (%) |
|-------------------|--------------------|--------------------|----------------|
| ≤19               | 0                  | 101                | 0.0            |
| 20–29             | 3                  | 742                | 0.4            |
| 30–39             | 3                  | 820                | 0.9            |
| 40–49             | 5                  | 392                | 1.3            |
| ≥50               | 4                  | 115                | 3.5            |

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443. West Nile Virus in Humans in Greece, 2010–2017
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Background. In 2010, the first West Nile (WN) virus outbreak was recorded in Central Macedonia, northern Greece, with 197 WN neuroinvasive disease (WNND) cases; the largest reported in Europe since 1996. In the consecutive years, seasonal outbreaks continued to occur. We investigated the 2010–2017 outbreaks to determine their extent, describe the geographical and temporal distribution of human cases and implement appropriate control measures.

Methods. We supported the investigation of suspected human cases and strengthened the laboratory surveillance. We interviewed cases and treating physicians and recorded suspected place of exposure, type of disease (WNND or non-WNND) and disease outcome. We estimated case fatality (CF) of neuro-invasive disease (WNND). PCR-positive samples were sequenced.

Results. Since 2010, a total of 672 human cases were recorded, from June to October, including 474 (71%) WNND cases. Cases were recorded for five consecutive
years, in 2010 (n = 262), 2011 (n = 100), 2012 (n = 161), 2013 (n = 86), and 2014 (n = 15); and then in 2017 (n = 48), after a 2-year period with no cases diagnosed. Since 2010, a total of 81 (CF=17%) fatalities occurred among WNND cases, with a median age of 80 (49–95) years. Cases were recorded in both, urban and rural areas, in half (37/74) of the Regional Units (NUTS-3 level), in all 13 Regions. In 2011, the virus disseminated westwards, affected a partially new region, and caused 30% of the total cases. It was recorded both in previously affected and in new areas, enhanced surveillance throughout Greece is critical to timely implement targeted control and prevention measures (i.e., communication campaigns, vector control, and blood safety measures).

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444. Zika Testing in a Large Academic Center During a Continental US Outbreak
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Background. Zika virus (ZIKV) is a flavivirus that is associated with spontaneous abortion, microcephaly, and severe neurological complications. The first continental outbreak of ZIKV in the United States was declared in Miami in 2016. This study reports reasons for performing ZIKV testing and the characteristics of nonpregnant individuals tested for ZIKV during the ZIKV outbreak in the largest academic center in Miami. The medical center is in close proximity to ongoing transmission areas and an emergency response system was rapidly initiated in response to the outbreak.

Methods. This study is a retrospective review of medical records from nonpregnant individuals who were tested for ZIKV at the largest academic center in Miami from January 1 to December 31, 2017. Data collected for patients testing for ZIKV were collected from the electronic medical record and compared between individuals who tested positive for ZIKV vs. those who tested negative.

Results. Forty nonpregnant individuals were tested for ZIKV and 14 tested positive for ZIKV. Individuals tested positive for ZIKV were more likely to reside in Miami with active ZIKV transmission (39% vs. 4%, P = 0.012). Thirty-four (92%) of tests were performed in the hospital setting (inpatient setting and emergency room) compared with outpatient setting. Individuals who tested positive for ZIKV were more likely to have been tested in the ER than in other settings. The most common symptoms prompting testing for ZIKV were fever, myalgia, arthralgia and headache however the presence of these symptoms was not significantly different in individuals who tested positive for ZIKV than in those who tested negative. Skin rash was more common in individuals who tested positive for ZIKV than in those who tested negative for ZIKV (93% vs. 27% P < 0.01). More individuals who tested positive for ZIKV personally requested testing (36% vs. 0%, P = 0.003).

Conclusion. In our study, clinical symptoms alone are not reliable for differentiating between individuals with positive ZIKV test results vs. those with negative test results. Patient request, rash, and exposure to transmission areas are important factors for healthcare providers to consider in identifying ZIKV infection. Similar approaches should be utilized in response to future emerging infectious threats.

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445. Cross-Reactivity Between Zika and Dengue Virus: A Cross-Sectional Analysis in Rio Grande do Norte, Brazil
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Background. Preexisting DENV antibodies may have a cross-reactivity against ZIKV. A recent primate study suggested that prior DENV infection does not adversely impact subsequent ZIKV disease and might be protective. This study aimed to evaluate the relation between a Dengue Fever (DF) outbreak in 2016 and the prevalence of ZIKV infection in Rio Grande do Norte (RN), a Brazilian northeast state endemic for arboviruses.

Methods. A cross-sectional analysis was conducted using data obtained through the RN Department of Health from January 2015 to April 2017. We analyzed the epidemiological behavior of DF and Zika Virus Disease in RN (last three summers).

Results. From January to March in 2015, 2016, and 2017, there were 6,902, 34,648, and 16,382 cases of confirmed DF cases in 2015, 2016, and 2017 were 523, 7,599, and 204, respectively. Regarding ZIKV infection, the number of suspected cases of between January to April during 2016 and 2017 were 3,486 and 86, respectively. The number of confirmed ZIKV infection in 2016 and 2017 were 97 and 0, respectively. Adding up the total cases of ZIKV infection which occurred during 2015 and 2016, we obtain a total of 14,584 (8,743 + 5,841). This number represents less than 0.5% of the RN population (3,409 million).

Conclusion. This epidemiological evidence support our hypothesis that the DF outbreak in 2016 contributed to the decrease of 97.53% (863,486) in the prevalence of ZIKV infection (suspected cases) in 2017. It may be explained by preexisting DENV antibody-mediated protection against ZIKV infection throughout Greece. It supports the results found on the recent primate study. In addition, our findings contradict the theory (based on in vitro experiments only) that previous immunity to DENV causes an enhancement of the immunological response in individuals exposed to ZIKV. Given the fact that in 2015 and 2016 and 2017 represent less than 0.5% of the RN population, we cannot state that there are fewer Zika cases in 2017 because the population has been previously immunized. These data are highly relevant from a public health standpoint given that regions which experienced ZIKV outbreak in Brazil are endemic for DF and suggests that DENV exposure might also offer some protection against ZIKV infection.

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446. Leveraging Partnerships to Care for Babies Born after Maternal Zika Infection—US Virgin Islands (USVI)
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Background. Since February 2016, the US Virgin Islands Department of Health (VIDOHO) has been monitoring the Zika outbreak and its effects on maternal and child health. As of March 19, 2018, the territory reported 291 women with confirmed laboratory evidence of Zika virus during pregnancy. Residents have limited access to the continuum of care services related to Zika virus disease. VIDOHO requested technical assistance from Centers for Disease Control and Prevention, Health Resources and Services Administration, Family Voices, and American Academy of Pediatrics to provide these services in the USVI in March 2018. A multidisciplinary team of two VIDOHO staff called 291 mothers, connected with 148, and scheduled 114 appointments. The clinic set-up included: two intake, four neurology, three ophthalmology, one audiologist, one developmental, child life team, and two exit stations. Infants received comprehensive neurology, developmental, ophthalmology, and audiometry examinations and developmental and medical services. For those infants with hearing loss, a recommendation for intervention services, Act Early: Learn the Signs, Disability Rights of the Virgin Islands and local specialized physicians. A data abstraction team of six reviewed charts for accuracy and abstracted data into both the US Zika pregnancy registry forms and the local Zika database.

Results. The visiting specialists evaluated 88 infants; 65 (73.9%) in St. Thomas and 33 (36.2%) in St. Croix. 84 (73.7%) appointments and four walk-ins. There were 53 (60.2%) males and 35 (39.8%) females. Seven (7.9%) infants were 0–2 months, 18 (20.5%) were 3–6 months, 38 (43.2%) were 7–12 months, 25 (28.4%) were 13–24 months. Fifty-eight (65.9%) infants were referred for further follow-up, 35 (40.6%) to an audiologist, 8 (9.5%) to an ophthalmologist, 11 (12.3%) to a developmental pediatrician, 10 (11.8%) for physical therapy, four (6.9%) for speech therapy, three (5.2%) for neuroimaging, three (5.2%) for occupational therapy, and 2 (2.3%) for an orthotraumatologist.

Conclusions. This project has led to the diagnosis of many of the infants screened. Further evaluation on these infants has been recommended based on clinical guidance for infants exposed to Zika virus infection. This can help to identify the types of hearing loss associated with Zika infection in utero.

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447. Infant Microcephaly During the Zika Virus Epidemic in Dominican Republic, 2016–2017
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Background. Zika virus infection (ZIKV) during pregnancy has been linked with fetal microcephaly. This study was to describe the chief finding in microcephaly cases that occurred during the ZIKV epidemic in Dominican Republic (DR) in 2016–2017.

Methods. We analyzed surveillance data from DR National System of Epidemiologic Surveillance. The Intergroup 216: Newborn size application tool was used to determine percentiles and in 2015 the study was the chief finding in microcephaly cases half were from the metropolitan area. Most (89%) received in-patient care and 13% had respiratory distress. One infant had a meningocoele and one died soon after birth. Nearly half (47%) of mothers were known to have ZIKV and 45 (53%) mothers recalled having ZIKV symptoms during their pregnancy. Among these 45 women, the most common