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Background. Distinguishing aspergillosis from mucormycosis is clinically important as different antifungal agents are required. However, the sensitivity of fungal culture is suboptimal and histomorphologic diagnosis is not always accurate due to morphologic similarities. We investigated the diagnostic performance of immunohistochemistry (IHC) test for diagnosis of aspergillosis and mucormycosis.

Methods. Patients who met the criteria for mycologically proven aspergillosis or mucormycosis and in whom formalin-fixed, paraffin-embedded tissues were available were enrolled at a tertiary hospital from January 1992 to October 2017. Mycologically proven invasive fungal infections were defined as there were the histologic evidence of tissue invasion of hyphae and the recovery of *Aspergillus* species or agents of mucormycosis (*Rhizopus* spp., *Cunninghamella* spp., *Apophysomyces*spp., *Saksenaea* spp., *Absidia* spp., *Mucor* spp.) by culture from sterile specimens. Anti-*Aspergillus* mouse monoclonal antibody (1:50; clone WF-AF-1; LSBio, WA, USA) and anti-*Rhizopus arrhizus* mouse monoclonal antibody (1:100; clone WSSA-RA-1; LSBio, WA, USA) were used for IHC test, and we evaluated the diagnostic performance of IHC test using sensitivity and specificity.

Results. A total of 32 invasive fungal infection including 12 proven mucormycosis and 20 proven aspergillosis were analyzed. The fungal species from sterile sites and diagnostic performance of IHC test for these 30 patients were shown in Table 1.

Conclusion. The IHC test seems to be useful in compensating the limitations of histomorphologic diagnosis in distinguishing between aspergillosis and mucormycosis.

Keywords. Aspergillosis; Mucormycosis; Histomorphology; Immunohistochemistry

Table 1: Diagnostic Performance of Mucormycosis and Aspergillosis Immunohistochemistry Tests in Proven Mucormycosis and Proven *Aspergillosis*

IHC Test Result	Proven Mucormycosis, No. of Cases (n = 12)	Proven Aspergillosis, No. of Cases (n = 20)	Diagnostic Performance % (95% CI)
Mucormycosis			
Positive	12	0	Sensitivity: 100 (70–100)
Negative	0	0	Specificity: 100 (80–100)
Aspergillosis			
Positive	0	18	Sensitivity: 90 (67–98)
Negative	0	2	Specificity: 100 (70–100)

Abbreviations: CI, confidence interval; IHC, immunohistochemistry.

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420. A Rapid PCR Assay Detects Fungemia Due to Mixed *Candida* Species That Is Missed by the Clinical Microbiology Laboratory

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Background. As identified by blood cultures, ~4% of candidemia is caused by mixed *Candida* spp. Studies of PCR-based diagnostics, however, suggest that ≥ 2 spp. can be detected in 6%–36% of candidemia. Our objective was to use molecular methods to determine rates of mixed *Candida* spp. fungemia at our center.

Methods. We devised a rapid, PCR assay that identifies *Candida* spp. by amplifying *ACT1* and accounting for differences in intron sizes. We extracted total DNA from blood culture bottles from 15 patients, from which *Candida* had been recovered by the clinical microbiology laboratory.

Results. Using standard laboratory protocols and MALDI-TOF, candidemia was ascribed to a single *Candida* sp. in 14 patients. In one patient, *C. albicans* and *C. glabrata* co-infection was identified. Using our PCR marker, threepatients (15%) were found to have mixed spp. infections, including the patient known to have *C. albicans/C. glabrata* co-infection. In one patient diagnosed originally with *C. glabrata* fungemia, *C. albicans* was also identified. In one patient diagnosed with *C. parapsilosis* fungemia, *C. fabianii* was also identified. In the latter two cases, analysis of colonies recovered from subculturing of blood culture bottles subsequently confirmed the presence of both spp. Comparative phenotypic studies of *C. parapsilosis* and *C. fabianii* isolates from the co-infected patient revealed that colony morphologies were indistinguishable on solid agar at 48 hours. Thereafter, *C. parapsilosis* formed smaller wrinkled colonies, comprised of a mixture of elongated and round cell morphologies, whereas *C. fabianii* demonstrated round small cells, and formed smooth, big colonies. In addition, *C. parapsilosis* showed increased agar invasion and echinocandin resistance. *C. fabianii* had increased growth rate, biofilm formation and resistance to neutrophil killing.

Conclusion. Mixed *Candida* spp. may account for more cases of fungemia than currently recognized by clinical laboratories. In some cases, failure to detect mixed spp. infections can have important clinical implications, including failure to appreciate antifungal resistance. It is possible that complementary phenotypic or virulence characteristics between isolates of different spp. may potentiate pathogenesis. More efficient methods of screening for mixed *Candida* spp. infections are needed for clinical laboratories.

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421. Babesiosis: Retrospective Review of 38 Cases from Upper Midwest

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Background. Babesiosis is a tick-borne illness caused by protozoal infection of the genus *Babesia*. Clinical presentation varies widely from asymptomatic to rapidly fatal infection and diagnosis requires a high index of clinical suspicion. It is an emerging health risk and clinicians need to be aware of its different clinical manifestations.

Methods. We retrospectively collected and analyzed data from 38 patients with babesiosis from 1990 to 2015.

Results. Mean age of patients was 63 years. 68% of patients required hospitalization with 21% requiring intensive care unit (ICU) stay. Mean length of illness before diagnosis was 15.6 days and symptoms comprised of malaise (82%), subjective fever (71%), chills (55%), anorexia (29%), arthralgia (29%), and nausea (16%). Only 47% of the patients recalled tick bites. Mean hemoglobin in the outpatients was 12.4 g/dL compared with 9.8 g/dL in the hospitalized patients ($P < 0.01$). Among hospitalized patients, mean hemoglobin for ICU admissions was 7.5 g/dL vs. 10.9 g/dL ($P < 0.01$) for those without ICU stay. Mean parasitemia was 10.1% in those requiring ICU compared with 1.4% in those admitted to the medical floor ($P < 0.01$). 28.9% had Lyme disease, and 10.5% had anaplasma coinfection. Co-morbidities included diabetes mellitus (n = 3), asplenia (n = 5), and immunosuppression (n = 3). Diagnosis was made with PCR and peripheral smear in 50% of patient whereas 50% were diagnosed with PCR alone. In 27% of patients with positive PCR, peripheral smear was negative. All patients with asplenia required hospitalization with 3/5 requiring ICU with initial parasitemia ranging from 2.5 to 28% and duration of parasitemia ranging from 10 to 142 days. Initial treatment comprised of clindamycin plus quinine in 31% of patients whereas combination of atovaquone and azithromycin was used in 69% of patients. Median duration of treatment was 10 days. Overall three patients underwent exchange transfusion with parasitemias ranging from 12.3 to 28.5%. None of the patients died during hospitalization.

Conclusion. Less than half of the patients with babesiosis recall tick bites. There is usually a delay in diagnosis of up to 2 weeks due to nonspecific nature of symptoms. In more than one-fourth of patients with babesiosis peripheral smear may be falsely negative. Hemoglobin and percentage parasitemia seemed to correlate with severity of illness.

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422. Brucellosis Regimens Comparison in a Saudi Tertiary Academic Medical Center

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Background. Brucellosis is a zoonotic infectious disease caused by *Brucella* spp. that affects multiple body systems and may lead to several complications. Saudi Arabia is one of the countries where brucellosis is endemic. The purpose of this study was to describe the epidemiological characteristics of brucellosis as well as assessing outcomes of different antibiotic regimens.

Methods. A retrospective cohort study was conducted in a Saudi tertiary academic medical center. Eligible patients were adults with confirmed brucellosis (via culture, antibody test, or both) seen between January 2008 and March 2018 who received antibiotic therapy. Endpoints included clinical cure, all-cause mortality, and length of stay (LOS). Data were analyzed using ANOVA and chi-square. A P-value of < 0.05 was considered statistically significant.

Results. Out of 580 patients screened, 79 met the criteria and were included in the study. Based on the most common regimens prescribed, patients were divided into three groups, doxycycline–rifampin–aminoglycoside (DRA) with 39 patients, doxycycline–rifampin (DR) with 28 patients, and other regimens with 12 patients. All groups did not differ in their baseline characteristics except for the location (mostly outpatients or inpatients and very few in the intensive care unit), duration of therapy, and the presence of co-infection (most patients did not have co-infections). The most common risk factor was consumption of raw dairy products and most patients had

both *B. melitensis* and *B abortus* in their culture and/or antibody test. There was no significant difference between the groups in terms of clinical cure, all-cause mortality, LOS, and end of therapy temperature, white blood cells counts, C-reactive protein levels, and erythrocyte sedimentation rates.

Conclusion. Due to lack of differences in clinical outcomes, all-cause mortality, LOS, and end of therapy parameters between the three groups, a regimen comprising two, rather than three, agents (namely doxycycline and rifampin) can be sufficient. Such finding complies with previous studies although replacing rifampin with an aminoglycoside might be superior per the World Health Organization guidelines for the treatment of brucellosis. Further studies with a larger sample size are warranted to confirm these findings.

Disclosures. **All authors:** No reported disclosures.

423. Ten-Year Experience of *Burkholderia pseudomallei* Infections in a Singapore Tertiary Hospital

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Background. *Burkholderia pseudomallei* is endemic in the tropics and associated with high mortality. We performed a retrospective study analyzing the clinical and microbiologic features of melioidosis, and predictors of mortality.

Methods. Patients with culture-positive melioidosis from 2006 to 2016 were identified from microbiologic records. Clinical data including demographics, treatment, and outcomes were extracted from medical records. Categorical variables were compared using χ^2 test or Fisher exact test while continuous variables were compared using Student's t-test or Mann–Whitney U test.

Results. Forty-three cases of melioidosis were identified. Presentations included fever (41.9%), respiratory symptoms (20.9%), and joint swelling (9.3%). 76.7% were bacteremic and 69.7% were culture-positive from a nonblood source. Mean time from presentation to positive microbiological data was 5.1 ± 6.4 days. Infection sites included pulmonary (62.8%), spleen (27.9%), skin/soft tissue (25.6%), and bone/joint (25.3%). Antibiotic susceptibility were as follows: ceftazidime (97.5%), imipenem (100.0%), trimethoprim–sulfamethoxazole (92.1%), amoxicillin–clavulanate (94.7%), and doxycycline (94.7%). Mean time from presentation to melioid-active coverage was 6.8 ± 9.1 days. Thirty-day all-cause mortality occurred in nine patients (from first positive culture); one patient died within 5 months. Univariable analysis associations with 30-day all-cause mortality were: intensive care unit (ICU) admission (OR 26.3, 95% CI 4.0–173.1, $P < 0.01$), mechanical ventilation (OR 15.0, 95% CI 2.6–85.0, $P < 0.01$), higher median Pitt Bacteremia Score (PBS) (4.0 vs. 2.0; $P < 0.01$), receipt of ceftazidime (vs. a carbapenem) as primary induction antibiotic therapy (OR 0.2, 95% CI 0.03–0.91, $P = 0.047$) and not receiving melioidosis-active induction intravenous antibiotics ($P = 0.04$). Multivariable analysis found mechanical ventilation to be an independent predictor for 30-day mortality ($P = 0.003$, OR 18.8, 95% CI 2.7–130.9).

Conclusion. ICU admission, a high PBS, and in particular, receipt of mechanical ventilation may help identify patients with high mortality risk. Delays in melioid-active therapy were not uncommon. Prompt recognition of melioidosis and early institution of active therapy, especially in the critically ill, may reduce mortality.

Disclosures. **All authors:** No reported disclosures.

424. Southern Arizona Town: Homes Colonized by Kissing Bugs. Is Chagas Disease Being Transmitted?

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Background. Bisbee, Arizona is a small mining community established 1880, located 11 miles from the United States–Mexico border with a total population of 5,500 residents. Homes in this town are revealing evidence of colonization by kissing bugs (triatomines), specifically *Triatoma recurva*, *T. rubida*, and *T. protracta*, which are known to harbor the causative agent of Chagas disease, *Trypanosoma cruzi*.

Methods. Community members who were bitten by triatomines, provided specimens from their homes, and completed a home evaluation as well as point-of-care testing for Chagas disease (Chagas Detect™ *Plus* (CDP) Rapid Test, InBiosInternational, Inc.).

Results. Twenty-two individuals from 17 households consented to participate and provided 117 triatomines collected from inside and/or outside their homes ($N = 70$ *T. rubida*; $N = 36$ *T. recurva*; $N = 11$ *T. protracta*). *Trypanosoma cruzi* DNA was detected by RT-PCR in 25.6% (30/117) of the total triatomines (31.4% (22/70) *T. rubida*; 18.2% (2/11) *T. protracta*; 16.6% (6/36) *T. recurva*). The median age of homes was 91 years. Mean persons per home was 2.2; with 1.0 dog and 0.8 cat per home. Seventy percent of homes used either a swamp cooler or central air conditioning. Only one home had used pesticides in an attempt to exterminate insects. All homeowners reported various wildlife near their home, including javelina, pack rat, rock squirrel, mule deer, and raccoon (Figure 1). Homeowners were asked to correctly identify these triatomines in a photo line-up of similar insects, and 75% of participants made a successful identification of at least one triatomine, 90.9% being able to identify *T. recurva*. When asked whether they had changed their sleeping patterns due to triatomine bites, 45.5% (10/22) had done so. The same surveyed group rated their frustration with triatomines in their home on scale of 1–10 (10 being the most frustrated) revealing a mean rating of 6.6; with nine individuals rating 10. CDP rapid testing of these participants ($N = 22$) were all-negative for serological evidence of *T. cruzi* infection.

Conclusion. Despite exposure to *T. cruzi*-positive triatomines among these household residents, some having sustained hundreds of bites throughout the years, we do not have evidence of transmission of Chagas disease. These are preliminary findings and further study is underway.

Figure 1.

Characteristic of home	Result
Median age of home	91 years
Persons / home	2.2 people
Dogs / home	1.0 dogs
Cats / home	0.8 cats
Use cooler or air conditioning	70%
Use pesticides	6%
Wild animals sighted around home	Raccoon, rock squirrel, mule deer, rats, javelina

Table 1: Results of home evaluation of owners bitten by kissing bugs (n=17)

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425. Chikungunya in Solid-Organ Transplant Recipients, a Case Series and Literature Review

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Background. Chikungunya virus is a recent emerging arbovirus in Latin America. Clinical manifestations can vary from fever and rash to severe chronic inflammatory arthritis. Few reports have been published regarding this infection in immunocompromised patients, including in solid-organ transplant (SOT) recipients.

Methods. We presented a case series of SOT recipients with confirmed Chikungunya infection by positive RT-PCR (LightMix® kit Chikungunya-virus, Light Cycler® Roche Diagnostics), during the 2015 epidemic in Colombia. In addition, we conducted a literature review, searching PUBMED, EMBASE, LILACS regarding Chikungunya infection in SOT recipients.

Results. Ten SOT recipients were included (five kidneys, four liver, and one liver/kidney transplant). The mean age of the transplant recipients was 47 years, 70% were women. The most frequent symptoms were arthralgia and fever. None of the patients required treatment in the intensive care unit; no fatal cases or graft rejection were reported. None of our patients had recurrent arthritis during the three months follow-up. In the literature review, we found 21 cases reported. All of them had a benign clinical course with no severe complications or death. No chronic inflammatory arthritis cases were reported.

Conclusion. CHIK infection in SOT recipient have a benign course, and have no chronic recurrent arthritis. We proposed that immunosuppression could decrease the risk of severe or chronic inflammatory manifestations.

Disclosures. **All authors:** No reported disclosures.

426. Post-chikungunya Chronic Disease and Its Impact on Quality of Life, Depression, Anxiety, Fatigue and Sleep Quality: Results From a 2-Year Follow-up Comparative Study of 62 Patients in La Virginia, Risaralda, Colombia

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