

Invited Speaker Abstracts

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Invited speaker-01

Epidemiology of invasive fungal infections in Iran

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Invasive fungal infections are increasing in hospital settings and according the risk factors for these infections are rising, it is likely that the prevalence of these opportunistic infections will continue to emerge in the coming decades. The fungal pathogens responsible for invasive fungal infections often include *Candida*, *Aspergillus*, *Mucor*, *Fusarium* and *Cryptococcus*. The diagnosis of such serious infections is so problematic, and despite the antifungal treatments, these infections can annually cause many deaths around the world. In recent years, the use of appropriate and effective antifungal agents has led to a change in the standard of treatment for many of these infections. In recent years, centers that provide information to the surveillance systems of hospital infections in the control and disease prevention centers have shown a significant increase in relation to hospital invasive fungal infections. In Iran, the prevalence of candidemia has doubled in some hospitals, especially in intensive care units. In most Iranian reports in the past two decades, *Aspergillus* has been the second most common cause of invasive fungal infections that have been isolated from patients.

Keywords: Fungal infections, fungal pathogens, Iran

Invited speaker-02

Mucormycosis and case presentation

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Mucormycosis, previously called zygomycosis, refers to several different diseases caused by infection with fungi in the order Mucorales. Most mucormycosis infections are life-threatening, and risk factors such as diabetic ketoacidosis and neutropenia are present in most cases. Severe infection of the facial sinuses, which may extend into the brain, is the most common presentation. Pulmonary, cutaneous and gastrointestinal (GI) infections are also recognized. Successful mucormycosis treatment requires correction of the underlying risk factor(s), antifungal therapy (traditionally with a polyene), and aggressive surgery. The following is a post-mortem image of a patient who had diabetic ketoacidosis and left rhinocerebral mucormycosis. Extreme malnutrition is also linked to mucormycosis, especially the gastrointestinal (GI) form. Iron is a growth stimulant for Mucorales, and deferoxamine acts as a siderophore that delivers iron to the fungi. Older iron chelators such as deferoxamine and all causes of iron overload are additional risk factors for mucormycosis. Trauma and the use of contaminated medical supplies over wounds are associated with cutaneous mucormycosis. In addition, patients with burns and those who use intravenous drugs are at a higher risk. Patients with mucormycosis should be treated in a tertiary care center with subspecialty units experienced in the management of this condition and its underlying risk factors. Correction of the underlying abnormality, prompt initiation of liposomal amphotericin B therapy, and surgical resection are critical. In this review we will present some interesting cases of mucormycosis from taleghani hospital of Tehran.

Keywords: Mucormycosis, Risk factors, Antifungal therapy

Invited speaker-03

Pulmonary manifestations of fungal infection in immunocompromised host

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The spectrum of immunocompromised hosts has expanded with prolonged survival for solid organ and hematopoietic cell transplant recipients, patients with immune deficiencies, and autoimmune disorders, as well as the development of novel cancer therapies. Immunocompromised individuals are at risk for opportunistic infections with fungi, such as *Aspergillus*, *Mucor*, *Fusarium*. Early diagnosis and specific therapy of fungal infections is the cornerstone of successful treatment. The general rule is to be aggressive in pursuing a specific microbiologic diagnosis in immunocompromised patients with pulmonary involvement. Invasive diagnostic techniques are often required. However, most initial therapy is empiric while awaiting diagnostic studies. With careful attention to individual patient characteristics, a limited differential diagnosis can be established and empiric antibiotic therapy tailored to treat the most likely pathogens and minimize toxicity and cost. Invasive pulmonary aspergillosis may have a clinical presentation similar to that of other angioinvasive molds such as mucormycosis and the non-*Aspergillus* hyphomycetes such as *Fusarium* and *Scedosporium*. β -D-glucan is a component of the cell wall of some but not all fungi and can be a useful noninvasive diagnostic aid in serum or bronchoalveolar lavage. The most common presentations of mucormycosis include rhino-orbital-cerebral and pulmonary infections. *Candida* pneumonia is rare and develops most often following candidemia and dissemination to the lung in immunocompromised populations.

Keywords: Pulmonary manifestations, Immunocompromised individuals, Fungal infection

Invited speaker-04

Emerging and Re-emerging Fungal Disease in Iran

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Introduction: Emerging fungal infections may be used to denote infections that have newly appeared in the population or those that are rapidly increasing in incidence or geographic range. Also Re-emerging fungal disease have been known for some time, had fallen to such low levels that they were no longer considered public health problems and are now showing upward trends in incidence or prevalence worldwide or have appeared in areas where they were not previously found. The epidemiology of these infections has changed during the past 20 years. The incidence has increased, and the population of patients at risk has expanded to include those with a broad list of medical conditions, such as: solid-organ transplantation, hematopoietic stem cell transplantation (HSCT), cancer, receipt of immunosuppressive therapy, Acquired Immuno Deficiency Syndrome (AIDS), premature birth, advanced age and major surgery. The aim of this study was to provide a brief presentation about emerging and re-emerging fungal disease in Iran.

Methods: In this study, we checked out available literatures concerning emerging and re-emerging fungal disease in Iran. Databases searched were MEDLINE (PubMed), Web of Science, Scopus, Science Direct and the Scientific Information Database (SID).

Results: Zygomycosis and aspergillosis are-emerging fungal disease and Candidiasis due to non-*albicans Candida* species, trichosporonosis, cryotococcosis, malasseziasis (due to non-*furfur* species) and

infection due to saprophytic moulds such as *Fusarium spp*, *Alternaria spp* and *Curvularia spp* are emerging disease in Iran, over the past 20 years.

Conclusion: The discovery of “new” species and the widening of geographic distributions of previously recognized organisms emphasizes that our understanding of fungal epidemiology is critically dependent on global collaborative efforts. Changes in hosts susceptible to infection, practice patterns, and diagnostic methods, and possibly changes in climatic influences, will likely continue to alter the epidemiology for years to come.

Keywords: Emerging Fungal Disease, Re-emerging Fungal Disease, Iran

Invited speaker-05

Management of invasive sinopulmonary Aspergillosis in neutropenic patients after chemotherapy

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Mold species that do not usually cause invasive infections in healthy people can grow well in patients who take chemotherapy and cause many complications. Such infections are an important life-threatening cause for these patients. Therefore, rapid measures are needed to detect and treat invasive fungal infections in these patients. The most common mold infection in most cancer center is Invasive Sinopulmonary Aspergillosis that needs timely diagnosis and early treatment. In recent studies, rapid diagnosis and initiation of anti-fungal drugs along with preventive and therapeutic strategies, including prophylaxis, empirical and pre-emptive therapy, are recommended to get the best outcomes. Diagnosis of invasive aspergillosis is better in these patients at first by non-invasive methods such as HRCT, PET, galactomannan, 1.3 BD glucan and PCR. In case of failure noninvasive methods and also possible more

invasive methods such as bronchoalveolar lavage or tissue sampling can be done to confirm invasive aspergillosis. According to the ECIL 2011 guideline, galactomannan is a useful marker for the diagnosis of invasive aspergillosis, which recent studies have shown that monitoring of serum galactomannan levels are effective in following the successful treatment of invasive aspergillosis.

Keywords: Sinopulmonary aspergillosis, chemotherapy, galactomannan

Invited speaker-06

Molecular typing of clinical *Cryptococcus neoformans* and *C. gattii* species complexes and cryptococcal antigen screening program in Iran—What can we do?

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Cryptococcus is an encapsulated, basidiomycetous yeast causing life-threatening disease affecting healthy and immunocompromised individuals, especially patients with AIDS. Among the 70 identified species of *Cryptococcus*, *Cryptococcus neoformans* and *Cryptococcus gattii* species complexes are the major causative agents of human cryptococcosis. Thought the epidemiologic studies help to evaluate the condition of the disease in each country, there is no extensive documented data about various aspects of cryptococcosis in Iran. In Middle East, the epidemiological data about cryptococcosis are restricted to a few report. In Iran, cryptococcosis is relatively rare disease to date and few cases were reported incidentally from 1969 to 2015, 13 cases have been published from Iran. Environmental survey of bird guano, soil for *C. neoformans* species complex showed between 0.8 and 34%, *Eucalyptus* trees has found to harbor *C. gattii*, while the survey of decaying wood has no results. It might be expected that the life style and cultural

changes in Iran that increase HIV infection and associated immunosuppression would therefore allow *C. neoformans* /*C. gattii* species complex to become an emerging pathogen in this region.

CrAg LFA (Cryptococcal Antigen Lateral Flow Assay) is an immunochromatographic dipstick assay for the qualitative and semi-quantitative detection of CrAg in CSF, serum or plasma has that shown equivalent or superior overall sensitivity compared to that of enzyme immunoassay (EIA) and latex agglutination (LA) test. CrAg LFA is applicable for screening of the serum of HIV patients with CD4 < 100 with a sensitivity of 100 % and a specificity of 99.8 %. CrAg LFA is heat-stable, inexpensive and requires minimal training for optimal use particularly in resource-limited settings. This novel test has the potential of being a point-of-care test and may substantially reduce the universal burden of cryptococcal meningitis. In Iran, with high morbidity and mortality of cryptococcal meningitis in HIV+/AIDS patients, a surveillance study about molecular type of causative agents and implement CrAg LFA into existing ART programs and diagnostic algorithms may provide a rational framework for the design of prevention and control strategies within Iran.

Keyword: *Cryptococcus neoformans*, Molecular typing, Cryptococcal meningitis, Cryptococcal antigen, Screening, HIV, Lateral flow assay, Iran

Invited speaker-07

***Scedosporium* species complexes in cystic fibrosis patients: The first experience from Iran**

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Background: Cystic Fibrosis (CF) is among the most common genetic disorders, which involve multiple organs including respiratory tract. Chronic colonization of the airways of the CF patients and infections due to a wide variety of opportunistic fungal pathogens including *Aspergillus* and *Scedosporium* species are currently increasing. On the other hand, the resistance of the *Scedosporium* species to commonly available antifungals challenges therapeutic options. In this present study for the first time we evaluated CF patients for the *Scedosporium* species and other fungi in the respiratory tract samples

and the antifungal susceptibility testing (AFST) of *Scedosporium* isolates against 15 antifungal agents.

Methods: During one year (from February 2017 to February 2018), 90 registered CF patients from Iran were included in the study. Sputum samples from all patients underwent direct microscopic examination and culture into four different media including Malt extract agar, Inhibitory mold agar, Brain Heart Infusion (BHI) and Scedo-Select III. The mold isolated fungi were identified by ITS and β -tubulin gene regions sequence strategies. In-vitro AFTS of *Scedosporium* species was performed according to the Clinical & Laboratory Standards Institute (CLSI) M38-A2 guidelines.

Results: Out of 90 CF patients, 47(52.2%) were male. The age of the patients ranged from 1 to 34 years, with a median of 15.84 ± 7.41 years. Out of 90 sputum samples, 3 (3.3%) cases were positive for *Scedosporium* species of which two isolates were characterized as *Scedosporium boydii* and one isolate as *S. ellipsoideum*. Of these 3 patients, *Scedosporium* species were detected by BHI and Scedo-Select III in each 3 patients. However the later showed greater rates of detection for *Scedosporium* specie. Among mold isolates, *Aspergillus* (41.7%) was the most common followed by *Scedosporium* specie (2.0%) and *Penicillium* (2.0%). *A. flavus* (29.4%) was the most prevalent isolates among different isolated *Aspergillus* species followed by *A. tubingensis* (24.7), *A. niger* (17.0%) and *A. fumigatus* (14.5%). The minimum inhibitory effect ranges of micafungin, anidulafungin, and caspofungin was 0.008-0.031 $\mu\text{g/mL}$, 0.0625-0.25 $\mu\text{g/mL}$, and 0.0625-0.25 $\mu\text{g/mL}$, respectively. All isolates of *Scedosporium* species were resistant to the triazoles tested, except luliconazole (LUL) and voriconazole (VOR), as exhibited the minimum inhibitory concentration (MIC) ranges of 0.5-1 $\mu\text{g/mL}$ for laniconazole, 1-> 16 $\mu\text{g/mL}$ for ravoconazole, and MIC values of 0.5 for VOR and > 16 $\mu\text{g/mL}$ for either itraconazole

or posaconazole. The best antifungal effect was observed for LUL with the MIC range of 0.0625-0.5 $\mu\text{g/mL}$.

Conclusion: Our study in concordance to previous reports showed that *Scedosporium* species are one of the major colonizing filamentous fungi in CF patients. In contrast to previous study from different countries, we showed that *A. flavus* is the most prevalent species of *Aspergillus* in clinical samples from Iran. Our findings have also revealed that Scedo-Select III can optimize the growth of *Scedosporium* species from clinical samples. We observed a significant resistance of *Scedosporium* species against the main antifungal agents in invasive fungal infections therapy as well as a good in-vitro activity of either VOR or echinocandins to these underrated emergent opportunistic fungal agents.

Keywords: *Scedosporium* species, *Aspergillus* species, Cystic Fibrosis, antifungal susceptibility testing

Invited speaker-08

Fungal infections in HIV/AIDS patients

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Fungi have presented as one of the most important etiologic agents responsible for important and life-threatening infections among patients with HIV/AIDS. *Pneumocystis jirovecii*, *Cryptococcus neoformans* and *Candida* species are main well-known causes of fungal infections in this setting. Moreover, other fungi such as *Histoplasma capsulatum* and *Coccidioides Immitis* (especially common in parts of the Americas) and *Talaromyces marneffeii* (prevalent in south and Southeast Asia) can also cause disseminated infection amongst these patients. With widespread accessibility of ART, the incidence of fungal infections has decreased dramatically. However,

considerable number of HIV patients may still involve with fungal infections.

Keywords: HIV/AIDS, fungal infections, ART

Invited speaker-09

Fungal Infection in Solid Organ Transplant

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Introduction: Fungal infections are major cause of morbidity and mortality among solid organ transplant recipients.

Methods: In this manuscript we will review different aspects of fungal infection in solid organ transplant recipient.

Results: Invasive Aspergillosis (IA) occurs in 1–15% of the solid organ transplant (SOT) recipients. Mortality rate in transplant recipients with IA historically has ranged from 65% to 92%. However, currently reported mortality rate in IA among SOT recipients is 22%. An estimated 9.3–16.9% of all deaths in transplant recipients in the first year have been considered attributable to IA. Although the outcomes have improved in the current era, IA remains a significant posttransplant complication in SOT recipients. Diagnosis of IA is challenging issue. Culture has low sensitivity (50%). Ball galactomanan is a promising tool but has many limitation. PCR and lateral flow needs more study. Antifungal prophylaxis with either a systemic triazole such as voriconazole or itraconazole or an inhaled AmB product for 3 to 4 months after lung transplant Systemic voriconazole or itraconazole is suggested over inhaled AmB for lung transplant recipients with mold colonization pre- or post-lung transplant, mold infections found in explanted lungs, fungal infections of the sinus, and single lung transplant recipients Combination therapy in the treatment of IPA has been supported by

favorable in vitro and in vivo preclinical data. Combination antifungal therapy with voriconazole and echinocandins may be considered in selected patients with documented IPA. Some adjunctive treatment such as Gama Interferon, G-CSF, Reducing dose of immunosuppressive and surgery may be effective.

Conclusion: IA is one of the most important opportunistic infection in SOL. Diagnosis is challenging and need usage of biomarkers and invasive procedures. Voriconazole is treatment of choice. Antifungal prophylaxis must be used. Reduction of immunosuppression is essential.

Keywords: Fungal, solid organ transplant, aspergillosis.

Invited speaker-10

Onychomycosis: Challenges in the management

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Onychomycosis is the most common nail disease in adults with the worldwide 5.5% prevalence. A rise in the prevalence of onychomycosis over the past few decades may be due to an increase in the number of immunocompromised individuals (including Diabetic people), longer life expectancies, increased urbanization and use of occlusive modern footwear. The disease is notoriously difficult to treat due to the deep-seated nature of fungi within the nail plate, prolonged treatment requirements, poor patient adherence and frequent recurrences. Given the poor efficacy of currently available topical and systemic therapies, there is a renewal interest in exploring alternative treatment modalities. Natural therapies, physical treatments and various combination therapies have all shown potential for its management.

Keywords: Onychomycosis, treatment, management

Invited speaker 11

Misdiagnosis in Mycotic Diseases

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Introduction: Clinical presentation of mycotic infections may mimic other diseases caused by parasites and other infectious microorganisms or non-infectious causes. In this study several fungal infections mimicking other diseases and vice versa are presented. To investigate cutaneous and subcutaneous and visceral mycotic diseases mimicking non fungal skin diseases, more than twenty cases were included in this study.

Methods: During past 4 decades, more than 50,000 patients with typical or atypical clinical presentations suspected to mycotic, parasitic, bacterial, viral or even idiopathic diseases referred to clinical Mycology laboratory in Emam Reza Hospital, Mashhad University of Medical Sciences, Mashhad, Iran. The data and information about several misdiagnosed cases with skin lesions were obtained. Obtaining their consent, pictures from them and their skin lesions were prepared to follow up them.

Results: Misdiagnosed cases were divided in two groups. The first group included those with primary and clinical diagnosis of non-fungal diseases, while they were victims of fungal infections. The second group included the patients with clinical manifestations mimicking mycoses. Several patients had history of 3-4 years misdiagnosis. Among those, few patients were followed up until obtaining definite diagnosis and proper treatment performed.

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Conclusion: It is concluded that clinical manifestation of mycotic diseases is not always helpful for accurate diagnosis. Obtaining clinical history and perfect examination of the patient is strongly recommended.

Keywords: Fungal disease, mycotic disease, mimicking, misdiagnosis, Iran

Invited speaker-12

Molecular differentiation and antifungal susceptibilities of *Candida parapsilosis* isolated from the Skin of Patients with Acne Clinical Protests

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Introduction: *Candida* or a yeast overgrowth may also possibly cause or aggravate a pre-existing acne condition. *Candida* may occur after long-term antibiotic use, which is particularly plausible when consider the nature of conventional acne treatments such as internally taken antibiotic medication and externally applied antibiotic ointments or creams. The aim of this study is to identify *Candida parapsilosis* from patients with acne and determine was their drugs susceptibility.

Methods: In this cross-sectional study of 70 clinical specimens from suspected skin with acne protests were collected by sterile swab and were streaked on SDA medium containing chloramphenicol. The plates were incubated for 48 hours in c°37. Suspected colonies were studied through microscopic examination and subsequent passage in accordance with Mycology of standard procedures and specify the type of fungal colony color in CHROM agar for the isolation of the yeast. For final approval, *Candida* species sequencing method (ITS2, ITS1 regions) was performed, and

susceptibility testing was performed to review *Candida* for drug-resistant isolates based on CLSI method.

Results: Overall, 11 *Candida* species including *C. parapsilosis* 8 (72.73%), *C. krusei* 1(12.5%), *C. lusitanae* 1(12.5%), *C. kefyr* 1(12.5%), and a *Trichosporon asahi* out of the collected clinical isolates were identified and isolated. *C. parapsilosis* isolates susceptibility to diverse concentrations of the anti-fungal agents to isolate Cp1 study indicates that the isolated Cp8 and Cp5 with MIC 50 equal to 32, 0.5, 0.25 and MIC90 of <64, <1, <0.5 µg/ml Fluconazole, Itraconazole and Ketoconazole were resistant respectively. Some of the isolates having relative strength, almost all other species of *C. parapsilosis* isolates were susceptible to these drugs.

Conclusion: Etiological factors, pathogenesis, drug resistance and risk factors of acne and the role of yeast to induce skin disease as a contributory factor in causing acne can be a topic of interest in dermatology.

Keywords: Acne, *Candida*, *parapsilosis*, antifungal susceptibilities

Invited speaker-13

Otomycosis, as a frequent disease in Babol Keivan Kiakojouri¹, Mojtaba Taghizadeh Armaki², Saeid Mahdavi Omran²,

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Introduction: Otitis is a frequent disease in all age, sex and community. Fungi are the second etiological agents. Regarding to *Aspergillus niger* introduced as the commonest fungal species in otomycosis, this study conducted for changes made around this matter in 10 years.

Methods: This review study evaluates all cases of fungal ear infections (otomycosis) in Babol city, northern Iran, over the past 10 years, according to search engines in web, 5th Iranian Congress in Medical Mycology, Tehran, Iran. All rights reserved. For permissions, please e-mail: cmm.mazu.com

such as PubMed, Google scholar, Iran Medex and exc.

Results: The results showed that women are more infected than men, and itching is one of the main symptoms of otomycosis. *A. niger*, *Aspergillus flavus* and *Aspergillus fumigatus* were the most fungal agents which isolated for ear canal.

Conclusion: According to our findings in this study otomycosis has a high prevalence in Babol and *A. flavus* has an important role in otomycosis.

Keywords: Otitis, Otomycosis, Prevalence

Invited speaker-14

Chronic Urticaria Hypersensitivity to *Candida albicans* and other fungi colonizing in gastrointestinal tract

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Introduction: It has long been known that chronic urticaria (CU) can arise as a response to chronic inflammatory, and particularly infectious, processes. Pathological gastrointestinal microbes and parasites are a relatively cause of CU. The importance of intestinal *Candida* colonization is a controversial matter. Considering the high incidence of chronic urticaria among patients relieved after treatment with antifungal drugs and the frequent difficulty in identifying the main etiologic factors we decided to investigate the possible role of *Candida* species and other yeasts usually found as contaminants in certain foods and beverages or routinely colonized in the gastrointestinal tract.

Methods: The patients with urticaria which had persisted for more than 6 weeks were selected at the Allergy and Hypersensitivity clinic, UMS University, Urmia, Iran. To confirm allergies to yeasts, Skin prick test

and Intra dermal skin performed. For biological studies, a fresh stool sample of each cases transported to the Medical Mycology Center, UMS University, Urmia, Iran, for the detection and identification of *Candida* and other yeasts colonized in their GI system. The morphologic examinations and PCR-RFLP, Sequencing and MALDI-TOF systems for *Candida* species and other yeasts were used respectively.

Results: Totally 390 hypersensitivity cases including urticaria and other dermal lesions were clinically diagnosed during 24 months, 2015 Sep. to 2017 Oct. From 390 stool sample, 96 fungal isolates were detected. Among all, 62 (64.6%) *Candida* species and 34 (35.4%) non *Candida* yeasts mainly *Geotrichum* were identified. *Candida* species included: 45 (72.5%) *C. albicans*, 4 (6.5%) *C. dubliniensis*, 4 (6.5%) *C. glabrata*, 3 (4.8%) *C. krusei* and 5 unidentified yeasts close to *Candida* species.

Conclusion: *Candida* organisms commonly colonize the human gastrointestinal tract as a component of the resident microbiota. Their presence is generally benign. Recent studies, however, show that high level *Candida* colonization is associated with several diseases of the gastrointestinal tract.

Keywords: Urticaria, *Candida*, Fungus, Gastrointestinal tract

Invited speaker-15

Clinical and therapeutic aspects of otomycosis

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AOE (acute otitis externa) accounts for approximately 2.4 million health care visits per year in US. Fungal external otitis represent less than 10% of AOE in immunocompetent patients. The age group with the highest incidence of AOE include 5-10 years-olds. Immunocompromised states such as diabetes mellitus or HIV infections can predispose to malignant otitis externa

(MOE) that actually is osteomyelitis of temporal bone. Chronic otitis externa (COE) represents a state of prolonged inflammation of the external auditory canal. Allergic reaction in ear canal to fungal infection elsewhere in the body have been described.

Keyword: Otomycosis, Fungal otitis, Osteomyelitis

Invited speaker 16

An Overview of Mycoses and Their Agents in Southeast of Iran: More Than a Decade Study

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Introduction: The increasing number of mycoses over the more than decade in both immunocompromised & immunocompetent patients has been encouraging. Nevertheless, due to the growing number of individual at risk, this phenomenon continues to be associated with significant morbidity and death and with increased financial burden to the health care system. Therefore, it is important to understand the epidemiology of regional mycoses and their agents. The variation in the distribution of mycoses in the country justify the conduction of epidemiological studies in order to contribute for the better understanding of patterns of mycological infections. In this project, we focus on fungal disease epidemiological trends and etiologic agents with a specific emphasis on the major groups in southeast of Iran.

Methods: A total of 2853 cases, including 1724 (60.43%) female and 1129 (39.57%) male with similar aspects to mycoses were evaluated, while 947 clinical specimens were obtained that laboratory and molecularly examined according to CLSI and EUCAST methodologies. All positive fungal cultures from infectious disease reference were

identified by routine mycology laboratory methods. Patient demographic and laboratory data were collected and analysed. Analysis of whole data was performed using SPSS version 21. To evaluate the results in details, chi-square test, Fisher's exact test and whenever required Odds Ratio and respective confidence interval were used and $P < 0.05$ was considered as statistical significance.

Results: 947 (22.68%) evaluated patients had mycoses, of whom 439 (46.36%) were female and 508 (53.64%) were male. The majority of mycoses were superficial infections and dermatophytosis (65.15%). These included yeast and mould infections. Most of mycoses were presented in middle-age groups. Superficial and dermatophytosis were common in outpatient clinics, however, most of deep mycoses were seen in inpatient clinics. Opportunist fungi accounted for the majority of the visceral mycoses. The most common etiological agents in dermatophytosis belonged to *Tinea mentagrophytes*. The frequency of deep mycoses increased noticeably. Among them, the incidences of candidiasis and aspergillosis increased the most. The predominant causative agent of deep ones was *Candida*, followed by *Aspergillus* and *Cryptococcus*, respectively.

Conclusion: Currently, the more than decade study of mycoses and etiologic agents in southeast of Iran, is variable and fragmentary. On the other hand, the information related to fungal infections and all related agents is still sparse, because of that, an epidemiological research on mycoses and their agents in all regions of our country is so important.

Keywords: Mycoses, Fungal Infection, Iran

Invited speaker-17

Mycetoma in Middle East, A 112 Years Review

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Introduction: Mycetoma is a chronic, deforming granulomatous and suppurative infection of the subcutaneous tissue, and in the some cases invade deeper organs, such as bone, muscle and lymphatic system. Disease was firstly described by Gill in Madras, India at 1842 and during 176 years (2018) thousands cases of diseases were reported throughout of world. Moreover, mycetomas have recently been recognized as a neglected tropical infection by the WHO. The global burden of mycetoma is not known due to the extent of disease has not been well documented, however, mycetoma is endemic specifically in tropical and subtropical countries. Generally, the belt of mycetoma are located at between latitudes 15°S and 30°N, South America, Mexico, Sudan, Somalia, Senegal and South of India. Based on causative agents, eumycetoma (fungi) and actinomycetoma (filamentous bacteria) are two common terms that used for this disease. In spite of, mycetoma affect all human body parts, the foot and legs are affected more than 80% of all cases.

Methods: The searching keywords were mycetoma, Madura foot, maduramycosis, actinomycotic mycetoma, actinomycetoma, eumycotic mycetoma, eumycetoma with the names of 16 Middle East countries. The search of literatures was performed by using the international resources; PubMed, Scopus, Google Scholar, Google. All published papers in full text in English and/or other languages with English abstract were selected for this review.

Results: The first case of mycetoma in Middle East was reported by Clemow from

Yemen at 1906 and during 112 years (2018) more than hundreds cases of mycetoma were reported in Middle East countries so far. Although, the sporadic cases of mycetoma have been reported from Middle East countries, Saudi Arabia, Yemen and Iran have the highest frequency of mycetoma. Disease mainly has been seen in the lower extremities, and the male to female ratio was 2.9:1. Analysis of the reports revealed that 55% and 45% of cases were actinomycetoma and eumycetoma, respectively. Furthermore, the majorities of mycetoma cases was found that attributed to outdoor activities.

Conclusion: At a glance, mycetoma has a low prevalence in Middle East countries. However, serious knowledge gaps exist, particularly in epidemiology and clinical management. On the other hand, disease burden needs to be defined.

Keywords: Mycetoma, Actinomycetoma, Eumycetoma, Middle East.

Invited speaker-18

Aspergillus flavus, Not *Aspergillus fumigatus*, is the main agent of Aspergillosis in Iran

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Introduction: *Aspergillus* species have emerged as important causes of life threatening infections in immunocompromised patients. They may range from localized to fatal disseminated infections. *Aspergilli* produce a large number of dry, hydrophobic conidia which are easily inhaled and the main source of aspergillosis is via the air through the inhalation of conidia. Climatic factors and use of antifungal drugs may play a central role in the distribution of *Aspergillus* species causing these infections. In this study, we evaluate the *Aspergillus* diversity in clinical and 5th Iranian Congress in Medical Mycology, Tehran, Iran. All rights reserved. For permissions, please e-mail: cmm.mazu.com

environmental samples in Iran based on calmodulin gene sequencing.

Methods: The studied strains were isolated from clinical and environmental sources at the university hospitals in Mashhad and Tehran (n=172; clinical = 107, environmental = 65). DNA was extracted from fresh cultures using the MoBio - UltraClean™ Microbial DNA Isolation Kit. The calmodulin (CaM) gene was amplified using the primers listed in Samson et al. (2014). The PCR fragments were sequenced with the ABI Prism® Big Dye™ Terminator v. 3.0 Ready Reaction Cycle sequencing Kit and analyzed on an ABI PRISM 3700 Genetic Analyzer. DNA sequences were edited with the DNASTAR computer package and an alignment of the sequences and phylogenetic analyses were performed using the MEGA v.6 software.

Results: Comparison of the generated *CaM* sequences with reference sequences revealed to following diversity: *Aspergillus flavus* (n=96), *A. tubingensis* (n=23), *A. welwitschiae* (n=18), *A. fumigatus* (n= 13), *A. sydowii* (n= 6), *A. niger*, *A. citrinoterreus* and *A. terreus* (all n= 2), *A. ochraceus*, *A. nidulans*, *A. montevidensis*, *A. minisclerotigenes*, *A. rugulosus*, *A. tabacinus*, *A. japonicus*, *A. niger*, *A. tritici* and *A. ustus* (all n=1). The generated sequences were submitted to GenBank under the accession numbers MG490497 - MG490655.

Conclusion: The results of this study demonstrate that *A. flavus* is the main agent of aspergillosis in Iran. *A. fumigatus*, the most common etiologic agent in other parts of the world ranked fourth, after *A. welwitschiae* and *A. tubingensis*, both members of *Aspergillus* section Nigri. Interestingly, *A. niger* was less commonly occurring and is phenotypically similar to *A. welwitschiae* and *A. tubingensis*, and a part the previous reports on *A. niger* probably include misidentifications.

Keywords: *Aspergillus flavus*, *A. welwitschiae*, *A. tubingensis*, *A. fumigatus*, Iran

Invited speaker-19

Calculate of Sample size in medical studies and power analysis

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Calculation of exact sample size is an important part of research design. It is very important to understand that different study design need different method of sample size calculation and one formula cannot be used in all designs. In this article different formulae of sample size calculations are explained based on study designs. In clinical research, sample size calculation plays an important role for assuring validity, accuracy, reliability, and integrity of the intended clinical study. For a given study, sample size calculation is usually performed based on some statistical criteria controlling type I error or type II error. To estimate sample size power analysis is probably the most commonly used method for sample size calculation. We will focus on sample size calculation based on power analysis for various situations in clinical research.

Keywords: Medical research, Sample size, Study designs, Statistical analysis (test statistic)

Invited speaker-20

Prevalence of *Malassezia SPP.* in the ears of dogs

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Yeasts of the genus *Malassezia* are lipophilic microorganism that are saprophytes that can act as opportunistic pathogens in animals. *Malassezia pachydermatis* is commonly isolated from the ear canal and skin of healthy dogs or in association with otitis external

conditions. The purpose of this study was to determine the prevalence of *Malassezia spp.* in the ears of dogs of Tehran province. During 12 months specimens were collected with sterile swabs from ears of 200 dogs. All samples were inoculated on the Saborured glucose agar (SGA) supplemented with olive oil. The identification of lipid dependent yeasts was based on the ability to use tween 20, 40, 60 and 80 and catalase reaction. In this study the prevalence of *Malassezia spp.* was 33% (66 case). The most isolated species was *Malassezia furfur* 33.33% (22 case) and then *Malassezia restricta* 19.69% (13 case), *Malassezia pachydermatis* 19.69% (13 case), *Malassezia slooffiae* 16.66% (11 case) and *Malassezia sympodialis* 10.60% (7 case) respectively. The potential for zoonotic transfer of *Malassezia spp.* from animals to human is also discussed.

Keywords: Dog, Prevalence, *Malassezia*

Invited speaker-21

Methods for isolation of fungal genomic DNA

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First step in PCR based methods for detection of pathogenic organisms is extraction of genomic DNA. Fungal organisms have rigid cell walls and sometimes covering with capsules that are relatively unsusceptible for rupture and hard to lyse and it makes difficult to reach the DNA. So, it is necessary to use a simple and rapid method of DNA extraction with high quality and quantity. A variety of methods and protocols have been established for fungal DNA extraction. However, many of these protocols are apparently suitable for certain groups or morphological forms of fungi but may not be versatile and efficient for extracting nucleic acids from diverse groups of filamentous fungi. No single method seems to be optimal for all fungi.

These methods may be used as single or in combination with different methods as follows: standard CTAB method, SDS method, combined CTAB and SDS method, Urea/Chelex/SDS method (for capsulated yeasts), lysis buffer and glass beads method (mechanical disruption with glass bead beating with a different lysis buffer or using a mortar and pestle), freeze-thaw with liquid nitrogen or a heat alkali treatment, freeze-boil, enzymatic lysis method (enzyme digestion), enzyme digestion and bead beating, microwave method, sonification method (ultrasound or sonification), commercial extraction kits, chemical methods (phenol-chloroform, guanidine thiocyanate), rapid and a direct methods and universal method. Cost effectiveness and obtain sufficient quantity and high quality of DNA must be consider in these methods.

Keywords: Genomic DNA, DNA extraction method, Fungal organisms

Invited speaker-22

Distribution and genetic patterns of *Trichophyton mentagrophytes* and *T. interdigitale* clinical isolates from Iran

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Introduction: *Trichophyton mentagrophytes* and *Trichophyton interdigitale* are two closely related species, causing

dermatophytosis in humans and animals. Based on the most recently suggested classification and new taxonomy of dermatophytes these taxa have taken new species concept. Currently, there are no systematic information supported by molecular approaches and sufficient coverage of new species concept on the epidemiology of *T. mentagrophytes* and *T. interdigitale* in Iran. In this investigation, the genetic diversity and distribution profiles of *T. mentagrophytes* and *T. interdigitale* clinical isolates from Iran was evaluated.

Methods: During a large scale study on dermatophytosis in Iran, the dermatophyte isolates from 7 provinces were primarily screened by PCR-RFLP of the ITS-rDNA region and strains suspected to *T. mentagrophytes* / *T. interdigitale* (*Tm/Ti*) were subjected to ITS-sequencing, ITS genotyping, phylogenetic analysis and pairwise sequence comparison. The correlation of *Tm/Ti* strains with type of infection was also evaluated.

Results: Totally, 343 isolates were identified as *T. mentagrophytes* (n=185) and *T. interdigitale* (n=158). *T. mentagrophytes* was isolated almost from all type of tinea infections while *T. interdigitale* was mainly isolated from tinea pedis and t. unguium. Except in Tehran, in other provinces, *T. mentagrophytes* was significantly more prevalent than *T. interdigitale*. Totally, 24 ITS-genotypes including 6 for *Ti* and 18 for *Tm* were identified of which some were new and specific genotypes for Iran. In pairwise sequence comparison, the inter-species variation between two taxa was low as 1-8 base pair.

Conclusion: Infections by *Tm* species is more prevalent than *Ti* in Iran and likewise the Iranian *Tm/Ti* isolates are genetically more diverse than similar known isolates in the world. Despite having difference in type of infections they cause, two species are very close.

Keywords: *Trichophyton mentagrophytes*, *Trichophyton interdigitale*, ITS, Iran

Invited speaker-23

21 plex PCR for Identification of Clinically Important Yeast Species: Useful for Developing Countries

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A growing population of immunosuppressed patients has resulted in increasingly frequent diagnoses of invasive fungal infections, including those caused by unusual yeasts genera. Delayed and inappropriate identifications are associated with a higher mortality rate and hospitalization costs. Despite the widespread usage of phenotypic and biochemical assays in routine laboratories, especially in developing countries, a multitude of studies have revealed that these assays misidentify uncommon yeast species. On the contrary, Sanger sequencing of common barcoding regions and MALDI-TOF MS are used in routine laboratories in developed countries, while they are regarded as unaffordable devices in developed countries. Recently, we have developed a multiplex PCR that in a stepwise manner identifies the majority of 21 clinically important yeast species. The accuracy and practicality of 21-plex PCR compared to API 20C AUX, MALDI-TOF MS and 28s rDNA. With the application of 21-plex PCR we correctly identified 87.3% of all yeast species included, 100% of most prevalent *Candida* species and 72% of rare yeast species. Due to the high accuracy and coverage of a broad range of yeasts, this assay could be useful for identification in routine laboratories and epidemiological studies in developing countries.

Keywords: 21-plex PCR, yeast infection, developing countries

Invited speaker-24

Identification of clinical dermatophyte isolates from Iran by matrix-assisted laser desorption ionization–time of flight mass spectrometry method

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Introduction: Matrix-assisted laser desorption/ionization time-of-flight (MALDI-TOF) mass spectra results are now widely used to discriminate pathogenic microorganisms in clinical microbiology laboratories. The aim of this study was to assess the utility of MALDI-TOF MS for routine identification of clinical dermatophyte isolates obtained from various geographical regions of Iran.

Methods: A total of 94 isolates including *Trichophyton interdigitale* (n=44), *Trichophyton rubrum* (n=40), *Trichophyton*

tonsurans (n=4), *Microsporum canis* (n=4), and *Epidermophyton floccosum* (n=2), were analyzed. The identity of each isolate was identified by PCR-sequencing of internal transcribed spacer region of nuclear encoded ribosomal DNA (ITS).

Results: Overall, MALDI-TOF MS results revealed species-level identification of 44 (47%) isolates by generating spectral score values of ≥ 2.0 . However, sufficient agreement was not found between the results obtained with molecular based ITS identification method and those with the MALDI-TOF MS for species identification of 16 (17%) dermatophyte isolates. The Bruker Daltonics database used also were not able to identify protein spectra related to 12 isolates (13%), including *T. interdigitale* (n=5), *T. rubrum* (n=4), *M. canis* (n=2) and *T. tonsurans* (n=1).

Conclusion: According to the results of our study the utility of MALDI-TOF MS as a routine diagnostic tool for accurate and reliable identification of dermatophytes can be justified whenever protein spectra of a large set of worldwide clinical isolates are included in the commercial libraries or alternatively used to construct an in-house reference database.

Keywords: MALDI-TOF MS, ITS phylogeny, Dermatophytes, Iran

Invited speaker-25

Multidrug Resistant *Candida auris*

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Candida auris is an emerging multi-drug-resistant yeast which was first isolated from the external auditory canal in Japan. *C. auris* is attracting great attention due to its globally rising reports, transmission through healthcare-workers, high rate of treatment failure, and multidrug resistant. Nowadays, reports from all continents except Australia

exist, i.e., Pakistan, India, South Korea, Malaysia, South Africa, Kuwait, Oman, Kenya, United Arab Emirates, Saudi Arabia, China, Venezuela, Colombia, the United States, Russia, Canada, Panama, the United Kingdom. *C. auris* is highly virulent, causes disease in all types of patients, and spreads easily in the environment and among patients, thereby posing an imminent threat to our patients. We conclude that *C. auris* is isolated not only from immunocompromised host, but also from otherwise healthy individuals. Therefore, comprehensive report of the global spread of *C. auris*, focusing on clinical and microbiological characteristics, mechanisms of virulence and antifungal resistance, and efficacy of available control, preventive, and therapeutic strategies highly recommended

Keywords: *Candida auris*, emerging pathogen, multidrug resistance

Invited speaker-26

Role of endoscopic sinus surgery on the fungal rhinosinusitis

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Categorization of fungal rhinosinusitis (FRS) into acute invasive, chronic invasive, and fungus ball varieties or as eosinophilic sinus disorders that include allergic fungal rhinosinusitis (AFRS) and nonallergic eosinophilic fungal rhinosinusitis (NAEFRS) has important prognostic and management implications. The treatment of choice in all types of sinonasal fungus infections are endoscopic surgical removal of necrotic tissue, fungus elements, allergic mucin and polyps followed by systemic or local medications. Different modalities of fungus infections with each diagnostic, surgical approaches and medical managements and prognosis will be discussed. Picture and video presentation of author experience will be presented.

Keywords: Fungal rhinosinusitis, endoscopic surgery, management, prognosis

Invited speaker-27

Laboratory identification of the microsporidiosis

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The Microsporidia family belong to the phylum Microspoa within the taxonomic group of Fungi. There are more than 140 genera and 1200 species in this family that are parasitic in all major animal groups including insects. Already seven genera (Enterocytozoon, Encephalitozoon, Nosema, Pleistophora, Vittaforma, Trachipleistophora & Brachiola) with some unclassified Spp. have been confirmed to cause human infections. *Microsporidia* are obligate intracellular spore forming eukaryote fungi with no active metabolic stages outside the host cell. The life cycle involves a proliferative merogonic stage followed by sporogony which results spores containing a tubular extrusion apparatus (polar tubules) for injecting infective spore contents into the host cell. They have 70S ribosomes & simple Golgi membrane with no mitochondria or peroxisomes. Fresh or preserved stool, duodenal drainage, urine, sputum, bronchoalveolar lavage (BAL), nasal secretion, cerebrospinal fluid (CSF), with conjunctival smears & biopsied tissues are clinical specimens which may send to laboratories. Light microscopy evaluation of smears after modified trichrome, acid fast – trichrome, rapid – hot Gram – chromotrope, Giemsa, Chemofluorescent & immuofluorescent staining of them, together with routine histology and electron microscopy evaluations, cell cultures molecular & serologic methods are the recommended laboratory methods for detection of microsporidiosis.

Keywords: Microsporidiosis, laboratory methods, detection

Invited speaker-28

Novel antifungals and drug delivery and therapeutic methods to overcome fungal infection

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Despite an increase in the prevalence of fungal infections globally, only a few therapeutic options are available to overcome these infections. Furthermore the routine treatments exhibit limited efficacy in the management of these infections. Comparing to the available antibacterial drugs, the number of therapeutic options for the treatment of fungal infections is very limited and few new class of antifungal drugs has been developed in the last 30 years. Hence, researchers are still trying to design and develop novel therapeutic methods and antifungal molecules to manage mucocutaneous and invasive fungal infections. In this regard, screening the antifungal activity of novel synthetic compounds and phytochemicals is one of the most common solutions to find an efficient antifungal. Recently, by using computer based molecular docking, interaction of the synthetic compounds with target molecules is predictable, and therefore, synthesis of efficient antifungal compounds is more likely. Furthermore, nano-particles with antifungal properties and smart antifungal molecules which can be guided to the site of infection are the novel approaches that might be used in the management of fungal infections. Incorporation of antifungal drugs into the core-shell nano-fibers by electrospinning, or into the nail lacquers are the other pharmaceutical approaches in treatment of cutaneous fungal infections. Here we summarize novel antifungals and drug delivery to overcome fungal infections.

Keywords: Antifungal drugs; fungal infections; drug development

Invited speaker-29

Clinical Laboratory Challenges in Diagnosis of Mycotic infections

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The increased frequency of invasive mycoses requires an enhanced index of clinical suspicion and a greater appreciation and recognition of the major risk factors that predispose patients to fungal infections. Clinical suspicion, thorough history and physical examination including evaluation for skin or mucosal lesions, inspection of all intravascular devices and careful ophthalmologic examination, diagnostic imaging of appropriate organ systems, and finally procurement of appropriate specimens for laboratory diagnosis are critical steps that must be taken. Because of non-specific nature of the clinical and radiological findings in mycoses, diagnosis usually depends upon 3 basic laboratory approaches: mycological, serological, and histopathological. Serological and cultural studies should always complement histopathology in the diagnosis of fungal infections. False-negative results may occur in 50% of certain mycoses, and compromised patients with a systemic mycosis are often immunologically unresponsive. In addition, serological tests are not available for many of the unusual or occasional mycotic pathogens. Culture of fungi is often a slow process, and results may not be available for several days or weeks. Moreover, when a mycosis is not suspected, the whole biopsy specimen is often fixed for histopathological examinations, so portions are not available for culture. When this occurs, histopathological and immunohistological techniques may be the only means of establishing an etiological diagnosis. Direct microscopic examination is the only reliable way of diagnosing certain fungal diseases, such as lobomycosis and rhinosporidiosis, for which isolation techniques do not currently

exist. The etiological significance of a cultural isolate can usually be determined by careful histopathological evaluation. Microscopic demonstration of tissue invasion and host reaction resolves the clinical dilemma of whether a fungal isolate is truly pathogenic, or merely a superficial colonizer, a component of the normal mycobiota, or an environmental contaminant. Microscopic evaluation of the inflammatory reaction and the distribution of fungal elements in a tissue section can also help to determine whether the disease is an invasive form or a purely allergic reaction, it can sometimes be used to assess the efficacy of antifungal therapy in pre- and post-treatment biopsy specimens. Detection of fungi in tissue and clinical material by direct examination is often helpful in determining the significance of culture results. This is especially true when the fungi isolated in culture are known components of the normal human flora or normally occur in the environment. Finally, detection of specific fungal elements by microscopy can assist the laboratory in selecting the most appropriate means by which to culture the clinical specimen. For example, the presence of hyphae of a zygomycetous organism should prompt the use of malt agar for its isolation. Although direct examination may be extremely valuable in diagnosing fungal infections, and must keep in mind that both false-negative and false-positive results may occur. There are several reasons for identifying to the genus and species level. Even though their clinical presentations may be indistinguishable, determination of the identity of the specific etiologic agent may have a direct bearing on therapeutic considerations and prognosis. Accurate identification of a fungus is essential because the management of one mycosis may be entirely different from that of another. Successful laboratory diagnosis of fungal infection is directly dependent on the proper collection of appropriate clinical specimens and the rapid transport of the specimens to the

clinical laboratory. Selection of appropriate specimens for culture and microscopic examination are based on clinical and radiographic examination and consideration of the most likely fungal pathogen that may cause such an infection. An adequate amount of suitable clinical material must be promptly submitted for culture and examination. Unfortunately, many specimens submitted to the laboratory are either of insufficient amount or of poor quality and are inappropriate to make a diagnosis. The clinical information is very important in guiding the laboratory efforts in terms of specimen processing and interpretation of the results. Challenges in diagnosis of mimicking clinical cases and sources of errors and mistakes in clinical mycology will be discussed.

Keywords: Laboratory diagnosis, fungal diseases, clinical specimens

Invited speaker-30

Role of Procalcitonin in the Diagnosis of Invasive Fungal Infection

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Invasive fungal infections are the important causes of morbidity and case fatality in immunocompromised patients. The respective mortality rate was reported to be 40–60%. Procalcitonin (PCT) is a marker of sepsis and can serve as a clue for antibiotic therapy. It is produced by the C cells of the thyroid gland in healthy individuals and its level is <0.1 ng/ml. In cases of infection, PCT is produced by extra thyroid cells, like monocytes and neuroendocrine lung cells. The cutoff concentration level for identification of sepsis in serum is about 2 ng/ml. In intensive care and surgery wards, PCT level is determined routinely for the diagnosis of respiratory distress syndrome or post-operative infectious diseases. Utility of PCT in the diagnosis of bacterial and viral

infections is accepted, and is a marker for rapid evidence of bacterial infection. A recently published research reported the PCT level is one of the ten priorities for future trials in the field of invasive fungal infections. Due to limited number of studies, the sensitivity and specificity of this marker in fungal infections has not been determined yet. According to a report, if fever persists for more than 5 days and PCT value is ≥ 3 ng/ml, invasive aspergillosis is diagnosed with finality, but in another study on leukemia patients, invasive pulmonary aspergillosis was associated with low PCT level. There is a significantly lower PCT level in patients with candidemia, compared to those with bacteremia. The PCT level higher than 2.5 ng/ml has reportedly a negative predictive value of 98.3% for identification of *Candida* spp. in the blood. The outcome of patients with invasive fungal infections seems to be associated with early detection and antifungal treatment. The turnaround time to the diagnosis of fungal infection is long, therefore, use of new identification test is critical. The diagnostic performance of PCT was evaluated in association with (1-3)-beta-D-glucan and clinical signs and symptoms of the patients. Due to the limitation of supporting document in the literature, the role of PCT in the management of antifungal treatment is far from established, and needs to be further investigated.

Keywords: Fungal infection, procalcitonin, aspergillosis, candidemia

Invited speaker-31

Diagnosis of fungal infection: current challenges and prospects

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In the recent years, the increasing of fungal infections which are difficult to diagnose and treat have mentioned as new important challenges, particularly in the immunocompromised host. Unfortunately, modern diagnostic tools have not been used in the mycology laboratory in most parts of the world. The traditional methods (culture and microscopic examination) that routinely used for the diagnosis of invasive fungal infections are insensitive and somewhat nonspecific. PCR-based molecular techniques are not clinically validated. The combining usage of both traditional and molecular methods with one or more of the newer diagnostic modalities (such as detection of beta-D-glucan, galactomannan, and molecular markers of resistance, microarray technology, sequencing, probe hybridization, real-time PCR and MALDI-TOF) will provide new insights into the fungal infections diagnosis.

Keywords: Fungal infections, diagnose, molecular methods

Invited speaker-32

Non-culture based diagnosis of Fungal Infections

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Aspergillus is a major cause of life-threatening infection in immunocompromised patients especially with allogeneic hematopoietic stem cell transplant (HSCT). Although it is recommend that tissue and fluid specimens be submitted in adequate quantities for simultaneous histopathologic/ cytologic and culture examination, these methods are time-consuming and insensitive and rapid diagnosis of aspergillosis is crucial for better treatment of patients. Blood-based PCR, serum assays for (1→3)-β-D-glucan and galactomannan (GM) are among non-culture-based biomarkers used for diagnosing of

fungal infections. *Aspergillus* PCR cannot yet be recommended for routine use in clinical practice because few assays have been standardized and validated, and the role of PCR testing in patient management is not established. Serum assays for (1→3)-β-D-glucan are recommended for diagnosing invasive aspergillosis (IA) in high-risk patients (hematologic malignancy, allogeneic HSCT), but are not specific for *Aspergillus*. The GM enzyme immunoassay is a relatively *Aspergillus*-specific, noninvasive diagnostic assay, with good sensitivity (approximately 70%) in serum of patients with hematological malignancy or allogeneic HSCT, but GM sensitivity in non-neutropenic patients appears to be lower than in other subgroups, and decreases to approximately 20% in solid organ transplant (SOT) recipients. Serum and BAL galactomannan is recommended as an accurate marker for the diagnosis of IA in adult and pediatric patients with hematologic malignancy and HSCT. GM is not recommended for routine blood screening in patients receiving mold-active antifungal therapy or prophylaxis, but can be applied to bronchoscopy specimens from those patients. GM is not recommended for screening in SOT recipients or patients with chronic granulomatous disease (CGD).

Keywords: *Aspergillus*, non-culture based diagnosis, galactomannan

Invited speaker-33

Application of mycotoxins in medicine

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Mycotoxin is a convenient generic term describing the toxic secondary metabolites

produced by fungi that are capable of causing disease and death in humans and animals. Because of their pharmacological activity, some mycotoxins or their derivatives have found using as antibiotics, growth promotants, and other kinds of drugs. This review focuses on the most important ones associated with application of mycotoxins as drug in medicine. Sometimes the line between toxin and drug is defined with the shift of a decimal point or a change in a small chemical moiety. But fortunately, recently many cure cases have been reported by different mycotoxins such as: using ergot for treatment of acute migraine attacks, schizophrenia and Parkinsonism.

Keywords: Mycotoxin, fungi, medicine

Invited speaker-34

The *Fusarium* and its metabolites, new findings

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A survey of *Fusarium* genus has been conducted over the past 100 years. The number of recognized species has fluctuated wildly from over 1, 000 to as few as nine. Also, at least seven species complexes (*Fusarium solani*, *F. oxysporum*, *F. incarnatum-equiseti*, *F. fujikuroi*, *F. clamydosporum*, *F. dimerum*, and *F. sporotrichioides*) were reported in this genus. The key morphological markers for the genus are the shape of the macroconidia and microconidia, and the presence or absence of chlamydospore. DNA sequencing technology has enabled the taxonomic resolution of *Fusarium* based on multi-gene genealogies. Currently, translation elongation factor 1-alpha (TEF-1 α) region and RNA polymerase II subunits 1 and 2 (RPB1 and RPB2) are important for molecular identification of *Fusarium* species. Some species are pathogen for human, etiological agent of disease ranging from

onychomycosis, localized skin lesions, mycotic keratitis to disseminated infections. The *F. keratoplasticum* and *F. petroliphilum* from *F. solani* species complex (FSSC) are the most common species of fusaria associated with human infections. Some species also produce mycotoxins such as trichothecenes, fumonisins, and zearalenone which can be harmful in humans and animals. In this review also we present new findings in related to *Fusarium* metabolites.

Keywords: *Fusarium* species, mycotic infections, metabolites, mycotoxins

Invited speaker-35

Fungal Biofilms

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Biofilms are colonies of microbial cells encased in a self-produced polymeric matrix and adherent to an inert or living surface. Most of biofilms are associated with indwelling medical devices and are highly resistant to antimicrobial drugs with several mechanisms. A variety of microorganisms such as bacteria, moulds and yeasts such as *Candida* can form biofilms. Within the biofilm, microorganisms use cell-to-cell communication systems to pool their activities and act in a multicellular organized manner. This process is termed quorum sensing (Q.S.) whereby microorganisms produce diffusible chemical signals (auto inducers) which regulate the expression of specific target genes, allowing them to survive in most adverse environments. In this lecture also we discuss experimental methods used to study fungal biofilms. There are several quantitative assays for monitoring biofilm formation such as determining the uptake of radioactively labeled leucine by fungal biofilm, using a treatment with dyes (XTT, MTT, CV), determination of dry weight, determination of the number of colony forming units, measurement of ATP

bioluminescence, visualization of biofilms using different microscopic techniques, including fluorescence microscopy, scanning electron microscopy (SEM), and more commonly, confocal scanning laser microscopy (CSLM), fluorescence microscopy.

Keywords: Biofilms, *Candida*, XTT, MTT

Invited speaker-36

Genome Projects of Mushrooms

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Introduction: After insects and arthropods, fungi have the widest diversity of species amongst all living organisms and the ecological balance in the Earth's biomass strongly depends on the diversity of fungi and fungal biodiversity. Considering the vital importance of fungi, the genomic project of "1000 Fungal Genome Projects", by the name 'Mycocosm', was used to identify phylogeny, genomic comparison, transcriptome and proteome, cytome, metabolome, interactome and ... fungi, identification of metabolites and medicinal and industrial fungi and the biological interactions and biomass of fungi with biomass and ... are being carried out and implemented and the results of these projects are available on exclusive fungal genome sites.

Methods: Some fungi such as *Schizophyllum commune* are considered to be an important living model for biological research and a large number of mushrooms have been selected by collecting wild species of these fungi for genomic analysis in the "1000 Fungal Genome Projects" project.

Results: The results of genomic chromosomal sequencing of these fungi, along with classification, phylogeny, genomic comparison, etc are available for bioinformatics analysis at <https://1000FungalGenomeProject.Org> and

<https://genome.jgi.doe.gov> within the subsection of this specialized site by the title "Mycocosm".

Conclusion: With the information on the genome sequencing of more than a thousand species of fungi at hand, a detailed and thorough description of the role and application of mushrooms for lignocellulose biocontrol, Mycorrhizal symbiosis, industrial application, sugar fermentation, toxicity plant pathogenicity etc. is available. In addition, the comparative genomic comparison of these fungi provides researchers with valuable information in terms of understanding the basics of biology, genomic evolution, biodiversity, biochemical cell cycles, and more.

Keywords: Mushrooms, genomic projects, specialized sites, interdisciplinary applications

Invited speaker-37

Enniatin B and Beauvericin: New Emerging Mycotoxins

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Beauvericin (BEA) and enniatin B (ENN B) are secondary metabolites synthesized by various toxigenic fungi, including several *Fusarium* species. Both have chemical structure of cyclic hexadepsipeptides and are able to grow in maize, wheat, rice and other commodities. Enniatin is a well-known antibacterial, antihelmintic, antifungal, herbicidal, and insecticidal compound. BEA- and ENN-mediated cytotoxicity towards various mammalian and cancer cell lines is only partially understood and engages some cellular targets and molecular mechanisms. Thus, the channel forming ability of BEA and ENN selectively directs a flux of cations particularly calcium into the cell. However, considering their high prevalence in grains destined for consumption, also potential systemic toxicity towards humans and animals has to be considered. Interestingly,

the few studies that have addressed this issue in animals so far predominantly reported slight effects at least as far as acute toxicity is concerned. For the several cell lines, cytotoxicity of these mycotoxins has been described to be based on apoptosis induction via the mitochondrial pathway. Thus, complete studies on the consequences of chronic and bolus BEA and ENN exposure are eagerly needed. This review summarizes the information on biochemical and biological activity of ENN B and BEA and focusing on toxicological aspects.

Keywords: Enniatin B, beauvericin, mycotoxin