

Abstracts**Tropical Diseases Bulletin****Vol 106 No 4-6 April-June 2009**

1582 PÉREZ-GUZMÁN, C.; VARGAS, M. H.; SALAS-MÁRTIR, C.; TREJO-SANTACRUZ, T.; GALLEGOS-DISCUA, C.; FLORES-LÓPEZ, F. [**Lipid profile in household contacts of patients with pulmonary tuberculosis.**] Perfil de lípidos en contactos convivientes de pacientes con tuberculosis pulmonar. *Revista Médica del Instituto Mexicano del Seguro Social* (2008) **46** (3) 247-252 Mexico City, Mexico; Instituto Mexicano del Seguro Social [Es, en, 33 ref.] Unidad Médica de Atención Ambulatoria, Instituto Mexicano del Seguro Social, Mexico, D.F., Mexico. Email: mhvargasb@yahoo.com.mx

A study was conducted to evaluate serum lipids in subjects exposed to mycobacteria. 25 pulmonary tuberculosis patients and 44 household contacts were studied and their serum lipids were compared [Mexico]. The results showed that total cholesterol, low density lipoprotein (LDL), and triglyceride concentrations increased with age in contacts but not in pulmonary tuberculosis patients. Multiple linear regression analysis showed that being a household contact was associated with higher levels of total cholesterol, LDL, high density lipoprotein (HDL) and triglycerides. It is concluded that the lipid profile differed between pulmonary tuberculosis patients and their pulmonary household contacts, thus indicating that low cholesterol levels might be a risk factor for developing pulmonary tuberculosis.

1583 HARFOUCH-HAMMOUD, E. I.; DAHER, N. A. **Susceptibility to and severity of tuberculosis is genetically controlled by human leukocyte**

antigens. *Saudi Medical Journal* (2008) **29** (11) 1625-1629 Riyadh, Saudi Arabia; Saudi Medical Journal Armed Forces Hospital [En, ar, 24 ref.] Laboratory for Research and Genetic Consultations, Faculty of Medicine, Damascus University, Damascus, Syria. Email: d-i-ibrahim@mail.sy

Objective: To assess the role of HLA polymorphism in the susceptibility to tuberculosis in Syria. Methods: We used the polymerase chain reaction with sequence specific primer method to study the DRB1* locus in 147 Syrian patients with positive sputum smear or sputum culture for *Mycobacterium tuberculosis* strains, and 209 Syrian healthy matching individuals with negative tuberculin skin test. Patients were randomly recruited from the Damascus Health Center of Tuberculosis and Pulmonary Diseases during 2005-2007. The study was carried out at the Laboratory for Research and Genetic Consultations, in the Faculty of Medicine of Damascus University, Damascus, Syria. Results: A significant decrease of the DRB1*11 allele was observed in patients compared to controls (34.7% in patients versus 51% in control, odds ratio [OR]=0.51, $p=0.003$, corrected $p=0.04$), whereas the DRB1*04 allele was increased in patients (38.8% in patients versus 26.4% in controls, OR=1.77, $p=0.01$, corrected $p>0.05$). This increase became significant when individuals with the DRB1*11 allele were removed from both patients and controls (33% in DRB1*11 negative patients versus 17% in DRB1*11 negative controls, OR=2.5, $p=0.003$, corrected $p=0.03$). In

addition, pulmonary cavitation was significantly increased in the DRB1*04 positive patients compared to patients without the DRB1*04 allele (33% in DRB 1*04 positive patients versus 16% in DRB1*04 negative patients, OR=2.7, $p=0.04$). Conclusions: The DRB1*04 allele is associated with susceptibility to pulmonary tuberculosis, whereas DRB1*11 is associated with protection from pulmonary tuberculosis in the Syrian population. In addition, cavity formation in patients with pulmonary tuberculosis seems to be favored by presence of the DRB1*04 allele.

1584 GIWA, A.; OSAGBEMI, G. K.; OLAYINKA, B. O.; GIWA, H. B. F. **Comparative cost-effectiveness analysis of streptomycin and ethambutol in the treatment of tuberculosis in a university teaching hospital in Nigeria.** *African Journal of Clinical and Experimental Microbiology* (2009) **10** (1) 47-55 Kwara State, Nigeria; African Journal of Clinical and Experimental Microbiology [En]

Healthcare organizations, governments and individuals have been forced by prevailing circumstances of economic crisis to be increasingly oriented towards cost containment due to escalating nature of health expenditure. Objective: The objective of this study is to determine the comparative cost effectiveness of various antituberculous therapeutic options and to make recommendation for the adoption of cost-effectiveness evaluations in National Health Policy formulation and decision-making. Method: Retrospective cost effectiveness analysis was carried out for prescribed/dispensed antibiotic to outpatients with tuberculosis among other infectious diseases in outpatients case notes between 2005 and 2007 in Ahmadu Bello University Teaching Hospital, Zaria Nigeria. Results: The result shows that ethambutol tablet cost N840/unit of effectiveness while streptomycin injection cost N81.50/unit of effectiveness in the treatment of tuberculosis. Ethambutol tablet therefore appears to be more cost effective than streptomycin injection. Subjecting the cost and effectiveness to sensitivity analysis did not change this

conclusion. Statistical analysis shows that there is a statistically significant difference in the effectiveness (outcome) of ethambutol (95%) and streptomycin injection (76.73%) ($\chi^2=13.75$; $p<0.5$). Therefore there is association between effectiveness and therapeutic option chosen with ethambutol tablet being a more cost effective option. The result of this study is significant because ethambutol is usually traded off for less costeffective streptomycin in many cases even when there is no contraindication to the use of ethambutol. CONCLUSION: Ethambutol tablet is more cost effective than streptomycin injection at their usual therapeutic doses in combination with isoniazid, rifampicin and pyrazinamide in the treatment of tuberculous at the intensive phase.

1585 SUN, J. R.; LEE, S. Y.; DOU, H. Y.; LU, J. J. **Using a multiplex polymerase chain reaction for the identification of Beijing strains of *Mycobacterium tuberculosis*.** *European Journal of Clinical Microbiology & Infectious Diseases* (2009) **28** (1) 105-107 Berlin, Germany; Springer-Verlag GmbH [En] Division of Clinical Pathology, Department of Pathology, Tri-Service General Hospital, 325, Section 2, Cheng-Kung Road, Neihu 114, Taipei, Taiwan. Email: jjl@ndmctsg.h.edu.tw

The genotype of a Beijing strain of *Mycobacterium tuberculosis* (MTB) is usually determined by spoligotyping. However, this technique requires special equipment and is time-consuming. In this study, we developed a new multiplex polymerase chain reaction (PCR) to differentiate between Beijing and non-Beijing strains of MTB. A total of 323 MTB isolates were genotyped by both spoligotyping and the novel multiplex PCR. By spoligotyping, 169 (52.3%) isolates were determined to be Beijing strains and the remaining 154 (47.7%) isolates were non-Beijing strains. The multiplex PCR method produced results identical to those of spoligotyping in the identification of Beijing strains of MTB. This method is highly sensitive, specific, and fast. It is also cost-effective and suitable for screening large numbers of samples.

1586 SOTO, A.; AGAPITO, J.; ACUÑA-VILLAORDUÑA, C.; SOLARI, L.; SAMALVIDES, F.; GOTUZZO, E. **Evaluation of the performance of two liquid-phase culture media for the diagnosis of pulmonary tuberculosis in a national hospital in Lima, Peru.** *International Journal of Infectious Diseases* (2009) **13** (1) 40-45 Oxford, UK; Elsevier [En, 34 ref.] Hospital Nacional Hipólito Unanue, Universidad Peruana Cayetano Heredia, Lima, Peru. Email: sotosolari@yahoo.com

Objective: To evaluate the diagnostic performance of two liquid-phase culture media for the diagnosis of pulmonary tuberculosis. Patients and methods: From May to July 2003, sputum samples for culture were obtained from patients with respiratory symptoms attending the Hospital Nacional Cayetano Heredia. These were cultured in Ogawa medium, mycobacteria growth indicator tube (MGIT), and modified Middlebrook 7H9. Results: were compared against a composite reference standard. Results: One hundred sputum specimens from 100 patients were included. Of these, 33 had culture-proven tuberculosis. The sensitivity of MGIT was found to be 100%. The modified Middlebrook 7H9 medium was found to have a sensitivity of 72.73%, while the sensitivity of Ogawa medium was found to be 69.70%. The mean growing time for MGIT was 12.18 days (95% confidence interval 10.24 to 14.12; $p < 0.01$ vs. Ogawa and modified Middlebrook 7H9); for modified Middlebrook 7H9 was 16.65 days (95% confidence interval 14.85 to 18.80; $p < 0.01$ vs. Ogawa), and for the Ogawa medium 25.74 days (95% confidence interval 22.22 to 29.6). Conclusions: The liquid culture medium MGIT was superior to the modified Middlebrook 7H9 and the Ogawa media, both in terms of sensitivity and shorter growing time of colonies of *Mycobacterium tuberculosis*. The modified Middlebrook 7H9 medium is significantly faster but comparable in diagnostic performance to Ogawa. Costs remain an issue for MGIT.

1587 MÁRQUEZ GARCÍA, G.; ESCARTÍN CHÁVEZ, M.; MILIÁN SUAZO, F.; PÉREZ GUERRERO, L. **[Epidemiological behaviour of tuberculosis in Queretaro, Mexico: a five year long assessment.]** Comportamiento epidemiológico de la tuberculosis en Querétaro, México: evaluación de 5 años. *Revista Salud Pública y Nutrición* (2008) **9** (3) unpaginated Monterrey, Mexico; Facultad de Salud Pública y Nutrición, Universidad Autónoma de Nuevo León [Es, en, 52 ref.] Facultad de Medicina, Universidad Autónoma de Querétaro, Querétaro, Mexico. Email: milian.feliciano@inifap.gob.mx

The objective of this study was to evaluate the epidemiological behaviour of tuberculosis in humans in Queretaro, Mexico. Information was obtained from TB state registries for the years 2001-2005. A case was defined as any patient with samples positive to any of the following: presence of bacillus acid-alcohol resistant, culture, TB-compatible lesions by histopathology, clinical or radiological evaluation. The total number of cases was 1109; 67.6% pulmonary and 32.4 extrapulmonary. Cumulative incidence by year was almost constant; it went from 195 to 262, while the incidence rate by 100000 inhabitants went from 13.1 to 17.6. Both, incidence rate and death rate increased with age; from 4.4% in patients 14 years old and younger to 67% in patients 65 years old and older. Most casualties were due to pulmonary TB (76%), followed by miliary TB, (10%). Partial information about occupation reports that 23% of cases were related to activities in agriculture and livestock management. Higher morbidity and mortality rates were observed in countries with high rates of poverty and cold during the winter. A discussion on deficiencies in registries and databases is included.

1588 TSAI MINYI; LIU HUIMING **Exposure to culturable airborne bioaerosols during noodle manufacturing in central Taiwan.** *Science of the Total Environment* (2009) **407** (5) 1536-1546 Amsterdam, Netherlands; Elsevier (En, 40 ref.)

Institute of Occupational Safety and Hazard Prevention, Hungkuang University, Shalu, Taichung Hsien, 433, Taiwan. Email: hmliu@sunrise.hk.edu.tw

Biological hazards associated with the manufacturing of noodles have not been well characterized in Taiwan. This is an issue that flour workers can be exposed to bioaerosols (airborne fungi and bacteria) resulting flour-induced occupational asthma or allergic diseases. This study is to survey the species and concentrations of bioaerosols at different sites within a noodle factory for one year, and to investigate the effects of environmental factors on concentrations of bioaerosols. Air samples were taken twice a day, one day each month using a MAS-100 bioaerosol sampler. Nine species of culturable fungi were identified, with the main airborne fungi being *Cladosporium*, *Penicillium*, *Aspergillus* spp., non-sporing isolates and yeasts. *Cladosporium*, *Penicillium* and *Aspergillus* were the dominant fungal isolates in the indoor and outdoor air samples. *Micrococcus* spp. and *Staphylococcus xylosum* were the dominant bacterial isolates. Peak fungal and bacterial concentrations occurred at the crushing site, with mean values of 3082 and 12,616 CFU/m³. Meanwhile, the most prevalent fungi and bacteria at the crushing site were in ranges of 2.1-1.1 µm and 1.1-0.65 µm, respectively. Significant seasonal differences in total bacterial concentration were observed at all sampling sites (*P<0.05). Moreover, significant seasonal differences were observed for most of the fungal genera except *Fusarium*. Levels of *Aspergillus* and *Rhizopus* differed significantly during the two sampling times, as did levels of *Micrococcus* spp. and *Staphylococcus arlettae*. Regarding the same operation procedures, relative humidity affected fungi levels more than temperature did. However, crushing generated the highest concentration of bioaerosols among all operation procedures. Furthermore, levels of bacteria at sites fitted with ventilation systems were lower than at sites without ventilation systems, especially at the crushing site.

Therefore, we recommend these workers at the crushing site wear breathing protection and improve the local ventilation systems to minimize the biological hazards.

1589 ENG. B.; CAIN, K. P.; NONG, K.; CHHUM, V.; SIN, E.; ROEUN, S.; KIM, S.; KEO, S.; HELLER, T. A.; VARMA, J. K. **Impact of a public antiretroviral program on TB/HIV mortality: Banteay Meanchey, Cambodia.** *Southeast Asian Journal of Tropical Medicine and Public Health* (2009) **40** (1) 89-92 Bangkok, Thailand; SEAMEO TROPED Network (En, 10 ref.) Banteay Meanchey Provincial Health Department, Sisophon, Cambodia. Email: kcain@cdc.gov

The WHO recommends antiretroviral therapy (ART) for most HIV-infected tuberculosis patients. To assess the impact of ART on tuberculosis case-fatality rates in Cambodia, we compared treatment outcomes of patients newly diagnosed with tuberculosis in 2004 (before implementation of ART clinics) with outcomes of patients diagnosed in 2005 (after these clinics opened). In 2004, 37% of HIV-infected tuberculosis patients died during TB treatment compared with 5% of HIV-uninfected tuberculosis patients. In 2005, 18% of HIV-infected tuberculosis patients died compared with 5% of HIV-uninfected tuberculosis patients. The case-fatality rate for HIV-associated tuberculosis decreased from 2004 to 2005, coincident with the introduction of ART.

1590 MANKATITTHAM, W.; LIKANONSAKUL, S.; THAWORNWAN, U.; KONGSANAN, P.; KITTIKRAISAK, W.; BURAPAT, C.; AKKSILP, S.; SATTAYAWUTHIPONG, W.; SRINAK, C.; NATENIYOM, S.; TASANEYAPAN, T.; VARMA, J. K. **Characteristics of HIV-infected tuberculosis patients in Thailand.** *Southeast Asian Journal of Tropical Medicine and Public Health* (2009) **40** (1) 93-103 Bangkok, Thailand; SEAMEO TROPED Network (En, 19 ref.) Bamrasnaradura Infectious Diseases Institute, Nonthaburi, Thailand. Email: jvarma@cdc.gov

To improve understanding about the epidemiology and clinical features of HIV-

associated tuberculosis (TB) infection we conducted a prospective, multi-center observational study of HIV-infected TB patients in Thailand. We enrolled HIV-infected patients diagnosed with TB at public health facilities from three provinces and the national infectious diseases referral hospital in Thailand. Patients underwent standardized interview, evaluations, and laboratory testing at the beginning of TB treatment. We analyzed demographic and clinical characteristics of patients and stratified our findings by level of immune-suppression and whether antiretroviral therapy (ART) was used before TB diagnosis. Of 769 patients analyzed, pulmonary TB was diagnosed in 461 (60%). The median CD4+ T-lymphocyte (CD4) count was 63 cells/ μ l [inter-quartile range (IQR), 23-163.5] and the median HIV RNA viral load was 308,000 copies/ml (IQR, 51,900-759,000) at the time of TB diagnosis. Methamphetamine use was reported by 304 patients (40%), marijuana by 267 patients (35%), and injection drug use by 199 patients (26%). Three hundred three patients (40%) reported having been previously incarcerated. Among sexually active patients, 142 (42%) reported never using condoms at all. Patients with CD4 counts <200 cells/ μ l were significantly more likely than patients with CD4 counts \geq 200 cells/ μ l to have extra-pulmonary TB, fever, fatigue, muscle weakness, no hemoptysis, tachycardia, low body mass index, jaundice, or no pleural effusion. Of the 94 patients that received ART before TB diagnosis, the median time from ART initiation to TB diagnosis was 105 days (IQR, 31-468). HIV-infected patients who developed TB after ART initiation were more likely than other HIV-infected TB patients to have extra-pulmonary TB, a normal chest radiograph, low HIV RNA viral load, or a history of previous TB treatment.

1591 SAR, B.; KEO, C.; LENG, C.; SAMAN, M.; MIN, D. C.; CHAN, S.; MONCHY, D.; SARTHOU, J. L. **Anti-tuberculosis drug resistance and HIV co-infection in Phnom Penh, Cambodia.** *Southeast Asian Journal of Tropical Medicine and Public Health* (2009) **40** (I) 104-107 Bangkok, Thailand;

SEAMEO TROPED Network [En, 13 ref.] Laboratory for Mycobacteriology, Unit of Clinical Testing, Institut Pasteur du Cambodge, 5 Boulevard Monivong, BP 983, Phnom Penh, Cambodia. Email: sborann@pasteur-kh.org, sarb@kh.cdc.gov

The objective of this study was to observe the prevalence of drug resistance in *Mycobacterium tuberculosis* isolates in HIV associated tuberculosis co-infected patients in Phnom Penh City. The isolates of *M. tuberculosis* were collected during active laboratory-based surveillance. Of the 98 isolates studied, *M. tuberculosis* resistance to isoniazid was seen in 23.5%, resistance to rifampicin was seen in 16.3% and multidrug-resistance (MDRTB) was seen in 5.1%. Our findings reveal an alarmingly high level of resistance to isoniazid and rifampicin, and confirms the need for drug susceptibility testing to guide treatment in patients with culture positive tuberculosis.

1592 JIN SANGMAN; LEE HYUNJU; PARK EUNAH; LEE HOYUN; LEE SANGMIN; YANG SEOKCHUL; YOO CHULGYU; KIM YOUNGWHAN; HAN SUNGKOO; SHIM YOUNGSOO; YIM JAEJOON **Frequency and predictors of miliary tuberculosis in patients with miliary pulmonary nodules in South Korea: a retrospective cohort study.** *BMC Infectious Diseases* (2008) **8** (160) (26 November 2008) London, UK; BioMed Central Ltd [En, 23 ref.] Division of Pulmonary and Critical Care Medicine, Department of Internal Medicine and Lung Institute, Seoul National University College of Medicine, 103 Daehangno Jongno-gu, Seoul 110-744, Korea Republic. Email: smj0919@medimail.co.kr., rosaceci@radiol.snu.ac.kr, iameuna1@gmail.com, chacha96@radio1.snu.ac.kr, sangmin2@snu.ac.kr, scyang@snu.ac.kr, cgyoo@snu.ac.kr, ywkim@snu.ac.kr, hansk@snu.ac.kr, ysshim@snu.ac.kr, yimjj@snu.ac.kr

Background: Miliary pulmonary nodules are commonly caused by various infections and cancers. We sought to identify the relative

frequencies of various aetiologies and the clinical and radiographic predictors of miliary tuberculosis (TB) in patients with miliary pulmonary nodules. Methods: We performed a retrospective cohort study of patients who presented with micronodules occupying more than two-thirds of the lung volume, based on computed tomography (CT) of the chest, between November 2001 and April 2007, in a tertiary referral hospital in South Korea. Results: We analyzed 76 patients with miliary pulmonary nodules. Their median age was 52 years and 38 (50%) were males; 18 patients (24%) had a previous or current malignancy and five (7%) had a history of TB. The most common diagnoses of miliary nodules were miliary TB (41 patients, 54%) and miliary metastasis of malignancies (20 patients, 26%). Multivariate analysis revealed that age ≤ 30 years, HIV infection, corticosteroid use, bronchogenic spread of lesions, and ground-glass opacities occupying $>25\%$ of total lung volume increased the probability of miliary TB. However, a history of malignancy decreased the probability of miliary TB. Conclusion: Miliary TB accounted for approximately half of all causes of miliary pulmonary nodules. Young age, an immunocompromised state, and several clinical and radiographic characteristics increased the probability of miliary TB.

1593 MASJEDI, M. R.; ASL, R. T.; FADAIZADEH, L. **Role of private laboratories in tuberculosis detection in Tehran, Islamic Republic of Iran.** *Eastern Mediterranean Health Journal* (2008) **14** (5) 1110-1118 Alexandria, Egypt; World Health Organization, Regional Office for the Eastern Mediterranean [En, ar, fr, 17 ref.] National Research Institute of Tuberculosis and Lung Disease, Tehran, Iran. Email: lfadaizadeh@nritld.ac.ir

To study the participation of the private sector in detection and diagnosis of tuberculosis, all suspected cases referring to 4 private laboratories in Tehran for acid-fast bacillus examination during 2002-03 were documented. Of 9037 cases enrolled in the study, 637 had

positive examination results (7.1%). Of these 531 (5.9%) cases were direct smear-positive and 489 (5.4%) were culture-positive. Data from the Iranian Ministry of Health showed 9479 cases referred to government laboratories in Tehran urban area during the study period, 208 (2.2%) of which were positive. This larger than expected proportion of TB patients who are detected and managed by the private sector indicates that much closer cooperation is needed between the public and private sectors.

1594 ASHO ALI; ZAHRA HASAN; TARIQ MOATTER; MAHNAZ TANVEER; RUMINA HASAN ***M. tuberculosis* Central Asian Strain 1 MDR isolates have more mutations in *rpoB* and *katG* genes compared with other genotypes.** *Scandinavian Journal of Infectious Diseases* (2009) **41** (1) 37-44 Stockholm, Sweden; Informa Healthcare [En, 43 ref.] Department of Pathology and Microbiology, The Aga Khan University, Stadium Road, Karachi 74800, Pakistan. Email: rumina.hasan@aku.edu

Pakistan ranks eighth globally among TB burdened countries, with a MDR rate of 2-5%. The most prevalent MTB genotype is Central Asian Strain 1 (CAS 1) followed by the Beijing genogroup. We investigated common mutations in multidrug resistance encoding genes *rpoB*, *katG* and *inhA* of CAS 1 and Beijing strains using DNA sequencing and fluorescent resonance energy transfer (FRET) probe based real-time-PCR methods. 30 CAS1, 12 Beijing and 20 unclustered spoligotypes, and 10 susceptible MTB strains were tested. The most common mutations in the *rpoB* gene were at codons 531 (60%), 526 (23%) and 516 (5%). CAS1 strains had a higher frequency of mutations at codon 526 ($p < 0.001$), with more concurrent mutations ($p < 0.05$) compared with Beijing and orphan types. Mutations at codon 315 of the *katG* gene were higher in CAS1 than Beijing strains ($p = 0.052$). Only 1/62 MDR strain, which belonged to CAS1, had a mutation in the *inhA* gene. Sensitivity and specificity of probe based assay was 93% and 100% for *rpoB*, and 95% and 100% for *katG*, respectively. The FRET probes method

detected 84% and 60% of *rpoB* and *katG* mutations and can therefore be used as a rapid method of screening MTB strains including CAS 1.

1595 KHIN SAW AYE; AYE AYE WIN; KHIN THAN MAW; KYAW KYAW; MATSUOKA, M.; SUZUKI, Y. **Dot blot hybridization method for rapid detection of drug resistant *Mycobacterium leprae* in Myanmar.** *Myanmar Health Sciences Research Journal* (2008) **20** (2) 67-70 Yangon, Myanmar; Department of Medical Research, Ministry of Health [En, 10 ref.] Immunology Research Division, Department of Medical Research (Lower Myanmar), Yangon, Myanmar.

Information on the susceptibility of *Mycobacterium leprae* isolates is beneficial for the proven multi-drug treatment and for verification of the efficacy of the current leprosy control program. A simple genotypic method to detect mutations conferring resistance to dapsone (DDS), rifampicin and quinolone was exploited on the basis of hybridization with capture probe fixed to a glass slide. Mutations were discriminated by a series of oligonucleotide probes corresponding to each mutation in the *folP*, *rpoB*, and *gyrA* genes of *Mycobacterium leprae*. Based on these mutations, genes containing these mutation points (hot spots) were amplified by polymerase chain reaction and followed by dot blot hybridization to detect mutations. This method is simple, rapid and not very expensive. The result can be obtained within 8 hours. A total of 100 mutibacillary leprosy cases from the Central Special Skin Clinic, Yangon General Hospital in Myanmar were determined for gene mutations. Ninety-three cases (93%) were susceptible to three drugs and seven cases (7%) were resistant. Among the resistant cases, 3 were DDS resistant, 1 was rifampicin resistant, 2 were quinolone resistant and 1 was both DSS and rifampicin resistant (multiple drug resistance).

1596 GELE, A. A.; BJUNE, G.; ABEBE, F. **Pastoralism and delay in diagnosis of TB in Ethiopia.** *BMC Public Health* (2009) **9** (5) (7 January 2009) London, UK; BioMed Central Ltd [En, 38 ref.] Institute of General Practice and

Community Medicine, Faculty of Medicine, University of Oslo, Oslo, Norway. Email: suuleycg@hotmail.com, g.a.bjune@medisin.uio.no, fekadu.abebe@medisin.uio.no

Background: Tuberculosis (TB) is a major public health problem in the Horn of Africa with Ethiopia being the most affected where TB cases increase at the rate of 2.6% each year. One of the main contributing factors for this rise is increasing transmission due to large number of untreated patients, serving as reservoirs of the infection within the communities. Reduction of the time between onset of TB symptoms to diagnosis is therefore a prerequisite to bring the TB epidemic under control. The aim of this study was to measure duration of delay among pastoralist TB patients at TB management units in Somali Regional State (SRS) of Ethiopia. Methods: A cross sectional study of 226 TB patients with pastoralist identity was conducted in SRS of Ethiopia from June to September 2007. Patients were interviewed using questionnaire based interview. Time between onset of TB symptoms and first visit to a professional health care provider (patient delay), and the time between first visits to the professional health care provider to the date of diagnosis (medical provider's delay) were analyzed. Both pulmonary and extrapulmonary TB patients were included in the study. Result: A total of 226 pastoralist TB patients were included in this study; 93 (41.2%) were nomadic pastoralists and 133 (58.8%) were agropastoralists. Median patient delay was found to be 60 days with range of 10-1800 days (83 days for nomadic pastoralists and 57 days for agropastoralists). Median health care provider's delay was 6 days and median total delay was 70 days in this study. Patient delay constituted 86% of the total delay. In multivariate logistic regression analysis, nomadic pastoralism (aOR. 2.69, CI 1.47-4.91) and having low biomedical knowledge on TB (aOR. 2.02, CI 1.02-3.98) were significantly associated with prolonged patient delay. However, the only observed risk factor for very long patient delay > 120 days was distance to

health facility (aOR 4.23, CI 1.32-13.54). Extra-pulmonary TB was the only observed predictor for health care providers' delay (aOR. 3.39, CI 1.68-6.83). Conclusion: Patient delay observed among pastoralist TB patients in SRS is one of the highest reported so far from developing countries, exceeding two years in some patients. This long patient delay appears to be associated with patient's inadequate knowledge of the disease and distance to health care facility with nomadic pastoralists being the most affected. Regional TB control programmes need to consider the exceptional circumstances of pastoralists, to maximize their access to TB services.

1940 MANGA, N. M.; DIOP, S. A.; NDOUR, C. T.; DIA, N. M.; MENDY, A.; COUDEEC, M.; TAVERNE, B.; DIOP, B. M.; SOW, P. S. [**Late diagnosis of HIV infection in the Fann, Dakar clinic of infectious disease: testing circumstances, therapeutic course of patients, and determining factors.**] Dépistage tardif de l'infection à VIH à la clinique des maladies infectieuses de Fann, Dakar: circonstances de diagnostic, itinéraire thérapeutique des patients et facteurs déterminants. *Médecine et Maladies Infectieuses* (2009) **39** (2) 95-100 Paris, France; Elsevier SAS [Fr, en, 17 ref.] Clinique des maladies infectieuses et tropicales Ibrahima Diop Mar, CHNU de Fann-Dakar, avenue Chaikh Anta Diop, BP 5035, Dakar, Senegal. Email: nmmanga@hotmail.com

The delay in the diagnosis of HIV infection is a major obstacle to optimal care for this disease. To deal with this problem, we conducted this study among newly diagnosed HIV patients hospitalized in the Fann University Hospital Infectious Diseases Clinic in Dakar, Senegal. The epidemiological, clinical, biological and outcome aspects are described and patient history reviewed. A qualitative socio-anthropological study was made to understand and describe the logic of the decision processes in the patient's search for treatment. 100 patients were included, with a mean age of 39.5±11.1 years and a sex-ratio: 1.08. The transmission was mainly

heterosexual (90%), and chronic diarrhoea (64%) and/or chronic cough (66%) were the principal symptoms leading to diagnosis. The mean delay before diagnosis was 5±4.27 months. The major opportunistic diseases were tuberculosis (44 cases) and infectious diarrhoea (23 cases). Most patients were diagnosed at the AIDS stage (97%) and the death rate was 30% among hospitalized patients after admission. 68% of patients had consulted at least three times, generally a "traditional practitioner", at first and 43% had been hospitalized at least once. The qualitative investigation revealed that the "representation" or the "feeling of severity" of the disease were the principal justifications for consulting the "traditional practitioner" or the physician, respectively. It is concluded that better information for health care workers and global population is necessary for an earlier diagnosis of HIV infection in Dakar.

1941 ENGELS, E. A.; SHEN, M.; CHAPMAN, R. S.; PFEIFFER, R. M.; YU, Y. Y.; HE XINGZHOU; LAN, Q. **Tuberculosis and subsequent risk of lung cancer in Xuanwei, China.** *International Journal of Cancer* (2009) **124** (5) 1183-1187 New York, USA; Wiley-Liss, Inc. [En, 24 ref.] Infection and Immunoepidemiology Branch, Division of Cancer Epidemiology and Genetics, National Cancer Institute, 6120 Executive Blvd, EPS 7076, Rockville, MD 20852, USA. Email: engelse@exchange.nih.gov

Tobacco and indoor air pollution from smoky coal are major causes of lung cancer in rural Xuanwei County, China. Tuberculosis has been suggested to increase lung cancer risk, but data from prior studies are limited. We conducted an analysis of data from a retrospective cohort study of 42,422 farmers in Xuanwei. In 1992, interviewers administered a standardized questionnaire that included lifetime medical history, including tuberculosis. Subjects were followed from 1976, with deaths from lung cancer ascertained through 1996. We used proportional hazards regression to assess the association between tuberculosis and subsequent lung cancer mortality. Tuberculosis was reported by 246

subjects (0.6%), and 2,459 (5.8%) died from lung cancer during follow-up. Lung cancer mortality was substantially higher in subjects with tuberculosis than in those without (25 vs. 3.1 per 1,000 person-years). The association was especially pronounced in the first 5 years after tuberculosis diagnosis (hazard ratios [HRs] ranging 6.7-13) but remained strong 5-9.9 years (HR 3.4, 95% CI 1.3-9.1) and 10+ years (HR 3.0, 95% CI 1.3-7.3) after tuberculosis. These associations were similar among men and women and among smoky coal users (70.5% of subjects). Adjustment for demographic characteristics, lung disease and tobacco use did not affect results. In Xuanwei, China, tuberculosis is an important risk factor for lung cancer. The increased lung cancer risk, persisting years after a tuberculosis diagnosis, could reflect the effects of chronic pulmonary inflammation and scarring arising from tuberculosis.

1942 SOUZA, A. D.; EL-AZHARY, R. A.; FOSS, N. T. **Management of chronic diseases: an overview of the Brazilian governmental leprosy program.** *International Journal of Dermatology* (2009) **48** (2) 109-116 Oxford, UK; Blackwell Publishing [En, 35 ref.] Department of Dermatology, Mayo Clinic, 200 First St SW, Rochester, MN 55905, USA. Email: elazhary.rokea2@mayo.edu

This review describes measures towards leprosy eradication in Brazil with a focus on improving housing conditions, sanitation, and education of the population. In addition, the consequences of leprosy-related disabilities and programmes to rehabilitate patients are discussed.

1943 GUTIÉRREZ-RUIZ, E. J.; ZAPATA-VILLALOBOS, D.; SIERRA-LIRA, E. M. **The role of the peasant production system on the spreading of the main zoonoses in Mexico.** In *Papers presented at the International Workshop "New Opportunities for Dairy and Dual Purpose Ruminant Systems in Latin America: Resource Management, Product Safety, Quality and Market Access", Ixtapan de la Sal, Mexico, 28-30 June 2006.* [Edited by Castelán Ortega, O. A.; Bernués

Jal, A.; Ruiz Santos, R.; Mould, F. L.]. Toluca, Mexico; Universidad Autónoma del Estado de México *Opportunities and challenges for smallholder ruminant systems in Latin America: resource management, food safety, quality and market access* (2008) 251-260 ISBN 978-970-757-133-4 [En, 16 ref.] Facultad de Medicina Veterinaria y Zootecnia, Universidad Autónoma de Yucatán, Km. 15.5 carretera Mérida-Xmatkuil, C.P. 97000, Merida, Yucatán, Mexico.

The presentation and spreading of zoonoses in the animal production systems are influenced by environmental, biological social, economical, technological and political factors. The peasant production systems in Mexico, is characterised by the use family working force, restricted economical resources, none or very limited access to technical assistance and poor productivity. From the sanitary point of view, conditions prevalent in these systems are a constant threat to public and animal health. This represent a challenge for the sustained social and economical development of the peasant protecting animal health and producing safe food for human consumption with minimal negative environment.

1944 GANDHI, N. R.; MOLL, A. P.; LALLOO, U.; PAWINSKI, R.; ZELLER, K.; MOODLEY, P.; MEYER, E.; FRIBDLAND, G. **Successful integration of tuberculosis and HIV treatment in rural South Africa : the Sizonq'oba study.** *JAIDS, Journal of Acquired Immune Deficiency Syndromes* (2009) **50** (1) 37-43 Hagerstown, USA; Lippincott Williams & Wilkins [En] Yale University School of Medicine, New Haven, Connecticut, USA, Email : neelgandhi@alumni.williams.edu

Background: Tuberculosis (TB) is the leading cause of death among HIV -infected patients worldwide. In KwaZulu-Natal, South Africa, 80% of TB patients are HIV coinfecting, with high treatment default and mortality rates. Integrating TB and HIV care may be an effective strategy for improving outcomes for both diseases. Methods: Prospective operational research study treating

TB/HIVcoinfected patients in rural KwaZulu-Natal with once-daily antiretroviral (ARV) therapy concurrently with TB therapy by homebased, modified directly observed therapy. Patients were followed for 12 months after ARV initiation. Results: Of 119 TB/HIV-coinfected patients enrolled, 67 (56%) were female, mean age was 34.0 years, and median CD4 count was 78.5 cells per cubic millimeter. After 12 months on ARVs, mean CD4 count increase was 211 cells per cubic millimeter, and 88% had an undetectable viral load; 84% completed TB treatment. Thirteen patients (11%) died; 10 (77%) with multidrug-resistant or extensively drug-resistant TB. There were few severe adverse events or immune reconstitution events. Adherence was high with 93% of study visits attended and 99% of ARV doses taken. Conclusions: Integration of TB and HIV treatment in a rural setting using concurrent home-based therapy resulted in excellent adherence and TB and HIV outcomes. This model may result in successful management of both diseases in other rural resource-poor settings.

1945 SAFAEIAN, M.; KIDDUGAVU, M.; GRAVIT, P. E.; GANGE, S. J.; SSEKASANVU, J.; MUROKORA, D.; SKLAR, M.; SERWADDA, D.; WAWER, M. J.; SHAH, K. V.; GRAY, R. **Prevalence and risk factors for carcinogenic human papillomavirus infections in rural Rakai, Uganda.** *Sexually Transmitted Infections* (2008) **84** (4) 306-311 London, UK; BMJ Publishing Group [En] Department of Epidemiology, Johns Hopkins University Bloomberg School of Public Health, Baltimore, Maryland, USA. Email: safaeianm@mail.nih.gov

Objective: To investigate self-administered vaginal swabs for assessing prevalence and correlates of carcinogenic human papillomavirus (HPV) infection in rural Rakai, Uganda. Methods: 1003 sexually experienced women enrolled in a community cohort provided self-administered vaginal swabs collected at annual, homebased surveys. Carcinogenic HPV prevalence, adjusted odds ratios (AOR), 95% confidence intervals (CI)

and associated risk factors were determined. Results: Carcinogenic HPV prevalence was 19.2%: 46.6% among HIV positive and 14.8% among HIV negative women ($p < 0.001$). Type-specific prevalence ranged from 2.0% (HPV 16 and 52) to 0.2% (HPV 31). Age-specific HPV prevalence decreased significantly ($p < 0.001$) among HIV negative women; however, the decrease among HIV positive women was not as pronounced ($p = 0.1$). Factors independently associated with carcinogenic HPV infection were HIV (AOR 4.82, CI 3.10 to 7.53), age (AOR 4.97, 95% CI 2.19 to 11.26 for 15-19 year olds compared to 40+ years), more than two sex partners in the past year (AOR 2.21, CI 1.10 to 4.43) and self-reported herpes zoster, candidiasis or tuberculosis (AOR 4.52, CI 1.01 to 20.31). Married women were less likely to have prevalent carcinogenic HPV (AOR 0.46, CI 0.30 to 0.70). Conclusions: HPV prevalence and correlates measured using self-administered vaginal swabs were similar to studies that use cervical samples. Thus, self-collection can be used as a substitute for cervical specimens and provide an important tool for research in populations unwilling to undergo pelvic exam.

1946 KHAN, F. Y. **Clinical pattern of tuberculous adenitis in Qatar: experience with 35 patients.** *Scandinavian Journal of Infectious Diseases* (2009) **41** (2) 128-134 Stockholm, Sweden; Informa Healthcare [En, 38 ref.] Department of Medicine, Hamad General Hospital, P.O. Box 3050, Doha, Qatar. Email: fakhnqal@yahoo.co.uk

A prospective observational study was conducted to describe the clinical presentation, diagnostic yield of fine-needle aspiration (FNA) cytology and lymph node biopsy and the outcome of tuberculous (TB) adenitis in patients admitted to Hamad General Hospital, Qatar, between 1 January and 31 December 2006. TB adenitis that was predominantly cervical was confirmed in 35 patients (28M, 7F) with a mean age of 29.4±9 y. Of the 35 cases, caseating granulomata were confirmed by FNA in 20, by lymph node biopsy

following negative FNA in 9, and by biopsy alone in 6. *Mycobacterium tuberculosis* was cultured from FNA alone in 24 cases, in 9 cases from biopsies after negative FNA and in 6 cases from biopsies alone. The tuberculin test (PPD) was positive in all patients with TB adenitis (100%), while an HIV test was negative in all. The sensitivity of FNA cytology alone was 69% but when combined with a skin test it was 85%. It can be concluded that FNA cytology has an important role in the evaluation of TB adenitis, as a non-invasive alternative to excisional biopsy. After 12 months from the start of a 6-month course of combined antituberculous treatment. 32 patients were cured whereas 3 patients had left the country before completing therapy.

1947 ARAUJO, Z.; GIAMPIETRO, F.; CANÇADO, L. C.; MAHAVIR SINGH; WIDE, A. **Comparison of serological responses in two different populations with pulmonary tuberculosis.** *Memórias do Instituto Oswaldo Cruz* (2008) **103** (7) 661-667 Rio de Janeiro, Brazil; Instituto Oswaldo Cruz [En, 34 ref.] Laboratório de Imunologia de Enfermedades Infecciosas, Instituto de Biomedicina. Facultad de Medicina, Universidad Central de Venezuela, Caracas, Venezuela. Email: zaraujogarcia@yahoo.com

Observational studies on the humoral immune responses of the Warao indigenous people from Delta Amacuro, an isolated area, were compared with urban residents of the Venezuelan capital. *Mycobacterium tuberculosis-specific* reactivities (IgM, IgE, sIgA, IgG and IgG subclasses) were measured by ELISA using PPD and 38-kDa *M. tuberculosis* antigens. A total of 294 individuals were studied, 162 Warao (indigenous people) and 132 Creole (non-indigenous people). The patient group consisted of 87 Warao patients and 58 Creole patients, while the control group consisted of 75 Warao controls and 74 Creole controls. Combinations among the isotypes studied were performed. The findings showed that for the Warao people, sensitivity to the combination including anti-PPD IgG and IgE was 92.0%, while

for the Creole people, sensitivity to the combination including anti-PPD IgG but more so anti-PPD IgG 1 and IgG2 was 90.0%. Simple tests were able to show higher specificities, which were population-specific; specificities were anti-PPD IgG3, 100.0% and anti-PPD IgM, 97.4% for the Warao and Creole peoples, respectively. In conclusion, while simple tests reached high specificity, the multi-isotype tests improved sensitivity; the latter shows this approach may be useful in diagnostic testing.

1948 VEEN, N. H. J. VAN; NICHOLLS. P. G.; SMITH, W. C. S.; RICHARDUS, J. H. **Corticosteroids for treating nerve damage in leprosy. a Cochrane review.** *Leprosy Review* (2008) **79** (4) 361-371 Colchester, UK; LEPRO [En, 30 ref.] Department of Public Health, Erasmus MC, University Medical Center, Rotterdam, PO Box 2040, 3000 CA, Netherlands. Email: n.vanveen@erasmusmc.nl

Objective: Corticosteroids are commonly used for treating nerve damage in leprosy. We assessed the effectiveness of corticosteroids for treating nerve damage due to leprosy. Methods: A systematic search was undertaken to identify randomised controlled trials (RCTs) comparing corticosteroids with placebo or with no treatment. Two authors independently assessed quality and extracted data. Where it was not possible to perform a meta-analysis, the data for each trial was summarised. Results: Three RCTs involving 513 people were found. Two trials compared prednisolone with placebo. One trial treated mild sensory impairment of less than 6 months duration and the other trial treated nerve function impairment of 6 to 24 months duration. Both trials examined nerve function improvement 12 months from the start of treatment, but found no significant difference between the two groups. The third trial compared three corticosteroid regimens for severe type 1 reactions. After 12 months, a significantly higher proportion of individuals on a 3 month course required extra corticosteroids compared to the groups with a high-dose and low-dose regimen of

5 months duration. Diabetes and peptic or infected ulcers were not significantly more often reported in the corticosteroid compared to the placebo group. Conclusions: Evidence from RCTs does not show a significant long-term effect for either long-standing nerve function impairment or mild sensory impairment. A 5 month corticosteroid regimen was significantly more beneficial than a 3 month corticosteroid regimen. Further RCTs are needed to establish the effectiveness and optimal regimens of corticosteroids and to examine new therapies.

1949 WALKER, S. L.; LOCKWOOD, D. N. J. **Leprosy Type 1 (reversal) reactions and their management.** *Leprosy Review* (2008) **79** (4) 372-386 Colchester, UK; LEPR [En, 74 ref.] Department of Infectious and Tropical Diseases, London School of Hygiene and Tropical Medicine, Keppel St, London WC1E 7HT, UK. Email: drstevewalker@hotmail.com

The type of leprosy that affects an individual depends on the immune response mounted against the organism. This leads to a spectrum of disease which may be complicated by immunological phenomena called reactions. Antimicrobial chemotherapy is effective in treating the *Mycobacterium leprae* infection but up to 30% of individuals with borderline disease experience Type 1 reactions (T1Rs). T1Rs are immunologically mediated episodes, localised in skin and nerves, which are a major cause of nerve function impairment. Nerve function impairment may result in disability and deformity. We review the frequency and features of Type 1 reactions. The data from the limited number of randomised controlled trials of treatment are discussed. These four randomised controlled trials were all conducted in south Asia. The accepted treatment of T1Rs is with oral corticosteroids but there is no consensus about the dose or duration of treatment due to the lack of data. One randomised controlled trial showed that patients treated with a 5 month course of prednisolone (total dose 2.31 g) were less likely to need

additional prednisolone than those treated with a 3 month course of prednisolone (total dose 2.94 g). This study did not use nerve function as an outcome measure. The improvement in nerve function impairment with steroid treatment is highly variable, with 33-73% of nerves recovering fully. Optimal steroid regimes and alternative treatments need to be identified if the disability associated with leprosy is to be minimised. *Search strategy* Papers for this review were identified by repeated searches of the Cochrane Clinical Trials Register, PubMed and LILACS with various combinations of the following search terms 'leprosy', 'lepra', 'reaction', 'steroids', 'corticosteroids', 'reversal', 'Type 1', 'Hansen*'. Searches were complete to the end of November 2008.

1950 SCHOONBAERT, D.; DEMEDTS, V. **Analysis of the leprosy literature indexed in Medline (1950-2007).** *Leprosy Review* (2008) **79** (4) 387-400 Colchester, UK; LEPR [En, 7 ref.] Institute of Tropical Medicine, Nationalestraat 155, B-2000 Antwerpen, Belgium. Email: bib@itg.be

Some 19 201 leprosy-related articles were identified in the *Medline* database for the period 1950-2007. These were analysed for distribution and evolution of a number of variables: publication years, languages, document types, journals, authors, major aspects and countries involved, and author addresses. Next to a number of tables presenting the actual results, some noteworthy trends and possible pitfalls in the interpretation of these results are discussed. The analysis shows that the number of leprosy-related articles peaked in the 1980s and has been in decline ever since, as well in absolute as in relative numbers. Coverage of non-English language literature has decreased far more strongly than that of English language articles. The scholarly input of a number of countries where the leprosy burden is the highest, such as India and Brazil, is clearly visible in the distribution of journals, authors, and for some, language, but this is certainly not the case for all countries afflicted.

1951 JACOBSON, R. R.; GATT, P. **Can leprosy be eradicated with chemotherapy? An evaluation of the Malta Leprosy Eradication Project.** *Leprosy Review* (2008) **79** (4) 410-415 Colchester, UK; LEPRO [En, 12 ref.] P.O. Box 1669, Woodstock, GA 30188, USA. Email: rraejacobson@msn.com

The Malta Leprosy Eradication Project (MLEP) was proposed in 1971 by Freerksen with the aim of eradicating leprosy in Malta. The project involved re-treatment of all known cases in Malta as of 1972 and all new cases thereafter with a regimen consisting of Isoprodian (a combination of dapsone, prothionamide and isoniazid) and rifampicin for varying intervals depending on the severity of their disease and their response to treatment. Overall the response to therapy was excellent with an extremely low relapse rate. During the 30 years of the project the incidence of leprosy steadily decreased continuing a decline that had started at least two decades earlier and Freerksen declared the disease eradicated from Malta in 2001. Although given the long incubation period of leprosy cases may still be occasionally detected in the future, the disease has been basically eradicated at this time and there are no patients currently receiving treatment. This work was done at the leprosy clinic, Boffa Hospital, Floriana, Malta.

1952 SAPKOTA, B. R.; KANCHHA SHRESTHA; BIJAY PANDEY; WALKER, S. L. **A retrospective study of the effect of modified multi-drug therapy in Nepali leprosy patients following the development of adverse effects due to dapsone.** *Leprosy Review* (2008) **79** (4) 425-435 Colchester, UK; LEPRO [En, 17 ref] Mycobacterial Research Laboratory and Department of Medicine, Anandaban Hospital, Kathmandu, Nepal. Email: drstevewalker@hotmail.com

Introduction: Dapsone Hypersensitivity Syndrome (DHS) occurs in approximately 2% of leprosy patients in Nepal. DHS and other adverse effects of dapsone lead to withdrawal of the drug. Methods: We reviewed the notes of patients who had dapsone withdrawn from their multi-drug

therapy (MDT) following an adverse reaction to the drug between 1990 and 2007. Results: 105 patients were identified from the database and 67 had a documented completion of a modified course of MDT. The majority were treated with rifampicin and clofazimine. All 36 individuals who were slit-skin smear positive had a satisfactory fall in their mean bacterial index. There were no cases of relapse. Conclusions: Rifampicin and clofazimine appear to be satisfactory treatment for both paucibacillary and multi bacillary patients who have to have dapsone stopped because of severe adverse effects.

1953 PAI, V. V.; GANAPATI, R.; LASRY, E.; PRASAD, S. N. **Cost-effective management of leprosy by involving interns.** *Leprosy Review* (2008) **79** (4) 448-449 Colchester, UK; LEPRO [En, 4 ref.] Bombay Leprosy Project, 11, VN Purav Marg, Sion-Chunabhatti, Bombay - 22, India. Email: bombayleprosy@gmail.com

The interns' tasks include history-taking and examination with a focus on the cardinal signs, identification and management of reactions and other leprosy-related signs. They are also taught how to do slit skin smears, and they assist in patient recruitment for clinical trials and research projects. Most interns also get an opportunity to visit the rural areas and urban slums where Bombay Leprosy Project (BLP) attends patients, which gives them a broader view of the reality of leprosy. The benefit is both to the interns, who have assessed their passage through BLP as a positive and useful experience, and to the practicing doctors at BLP, since part of their work is reduced. Since 1997, four allopathic medical practitioners have been working full-time at BLP. At present, the cost of a parttime doctor in Bombay is approximately Rupees (Rs) 600 per day. The allopathic medical college receives Rs 36300 per year from BLP, resulting in a cost of Rs 78.91 per intern per day. The interns from the homeopathic college attend at no extra cost for BLP. The reduction in cost per year since this scheme started has been Rs 203700/US 5092.50.

1954 HARRIES, A. D.; BILLO, N.; KAPUR, A. **Links between diabetes mellitus and tuberculosis: should we integrate screening and care?** *Transactions of the Royal Society of Tropical Medicine and Hygiene* (2009) **103** (1) 1-2 Oxford, UK; Elsevier [En, 5 ref.] International Union against Tuberculosis and Lung Disease, Paris, France. Email: adharries@iuatld.org

Recent systematic reviews show that diabetes mellitus (DM) increases the risk and odds of developing tuberculosis (TB), especially in young people and in developing countries with a high background incidence of TB. There are no data showing that TB increases the risk of DM. The large dual burden of disease may make management of both conditions more difficult. High-quality implementation research is needed to assess the value and ways of screening for DM in patients with TB and vice versa, and to set up standardised systems of monitoring and evaluation based on the directly observed treatment, short-course (DOTS) model used for TB control.

1955 MATTHYS, F.; PERALTA PÉREZ, M.; VALDÉS DÍAZ, S.; GARCÍA SILVERA, E.; CRESPO DÍAZ, T.; ARMAS PÉREZ, L.; GONZÁLEZ OCHOA, E.; STUYFT, P. VAN DER **Diagnostic validity of an expert tuberculosis commission that assists the diagnosis of bacteriologically negative suspected TB cases in Havana, Cuba.** *Transactions of the Royal Society of Tropical Medicine and Hygiene* (2009) **103** (1) 52-58 Oxford, UK; Elsevier [En, 22 ref.] Epidemiology and Disease Control Unit, Department of Public Health, Institute of Tropical Medicine, Antwerp, Belgium. Email: ochoa@ipk.sld.cu, ochoa@ipk.sld.cu

The Provincial Tuberculosis Commission of Havana, Cuba, a multi-speciality committee, assists clinicians in diagnosing bacteriologically negative tuberculosis (TB). At its weekly meetings, clinicians present the files of suspected TB cases for discussion, diagnosis and recommendations. This prospective study

assessed the validity of the diagnoses made by the Commission by comparing the diagnoses made with diagnoses ascertained after one year of follow-up. Between October 2002 and December 2003, 126 patients suspected to have TB but who were bacteriologically negative completed diagnostic work at the Commission. Fifty-three (42%) were diagnosed as TB cases. The definite diagnosis of 116 patients (92%) was ascertained after one year of follow-up. Six patients diagnosed by the Commission as TB cases were suffering from other diseases, while one patient diagnosed with pneumonia had a definite diagnosis of pulmonary TB. The diagnostic sensitivity and specificity of the Commission were 98% (95% CI 93-100) and 92% (95% CI 85-98), respectively. The Provincial Tuberculosis Commission of Havana can be considered a valuable tool for the diagnosis of TB in patients suspected of TB but who are bacteriologically negative. A comparable approach, adapted to the local conditions, could prove useful in other epidemiological and healthcare settings.

1956 KITTIKRAISAK, W.; BURAPAT, C.; KAEWSAARD, S.; WATTANAAMORNKIET, W.; SIRINAK, C.; SATTAYAWUTHIPONG, W.; JITTIMANEE, S.; POBKEEREE, V.; VARMA, J. K. **Factors associated with tuberculosis treatment default among HIV-infected tuberculosis patients in Thailand.** *Transactions of the Royal Society of Tropical Medicine and Hygiene* (2009) **103** (1) 59-66 Oxford, UK; Elsevier [En, 24 ref.] Thailand Ministry of Public Health-US Centers for Disease Control and Prevention Collaboration, Nonthaburi, Thailand. Email: jvarma@cdc.gov

Ensuring completion of tuberculosis (TB) treatment remains a major public health problem. In HIV-infected patients, TB is the most common severe opportunistic infection. Few studies have evaluated risk factors for TB treatment default in HIV-infected patients. We conducted a prospective, observational study of HIV infected TB patients in Thailand. Patients

underwent standardised evaluations at the beginning of TB treatment, at the end of the intensive phase and at the end of TB treatment. TB treatment outcomes were assessed according to WHO guidelines. The analysis was limited to patients who defaulted or who had treatment success. Of the 554 patients analysed, 61 (11%) defaulted. In multivariate analysis, factors associated with TB treatment default included incarceration history (adjusted odds ratio (AOR) 2.0, 95% CI 1.1-3.7), smoking (AOR 2.3, 95% CI 1.3-4.1) and having a symptom complaint score >15 (AOR 3.4, 95% CI 1.4-8.0); one marker of wealth, namely owning a refrigerator, was protective (AOR 0.4, 95% CI 0.2-0.8). Default during TB treatment was a significant problem in HIV-infected patients. Reducing default may require enhancing services for patients with a history of incarceration or smoking and designing patient-centred systems to address poverty and patient wellness.

1957 ANI, A. E.; IDOKO, J.; DALYOP, Y. B.; PITMANG, S. L. **Drug resistance profile of *Mycobacterium tuberculosis* isolates from pulmonary tuberculosis patients in Jos, Nigeria.** *Transactions of the Royal Society of Tropical Medicine and Hygiene* (2009) **103** (1) 67-71 Oxford, UK; Elsevier [En, 15 ref.] Department of Medical Microbiology, University of Jos, and APIN Centre, JUTH, Jos, Plateau State, Nigeria. Email: aniaek@yahoo.com

The drug resistance profile of 100 *Mycobacterium tuberculosis* isolates from pulmonary tuberculosis (PTB) cases in Jos, Nigeria, was investigated between August 2006 and September 2007. Drug susceptibility testing for 50 new, 11 follow-up and 39 unclassified cases of PTB was performed on Lowenstein-Jensen medium by the proportion method, using isoniazid (0.2 µg/ml), rifampicin (40 µg/ml), ethambutol (2 µg/ml) and streptomycin (4 µg/ml). Susceptibility to all four drugs was found in 76, 62 and 55%, and multidrug resistance (combined resistance to isoniazid and rifampicin with or without resistance to any other drug) in 4,

31 and 18% of the new, unclassified and follow-up cases, respectively. Monoresistance was found in 15% of the cases. Nine of the 16 isolates (56%) showing multidrug resistance were resistant to all four drugs. These findings are critical and the risk to public health is high, particularly with an overall multidrug resistance of 16%. We suggest that TB management and control programs in Jos are revised to enhance patient's accessibility to treatment sites, promote patients' adherence to drugs, improve diagnostic practices, regularly assess drug resistance profiles, and undertake contact tracing for patients with multidrug-resistant TB.

1958 DIANDÉ, S.; SANGARÉ, L.; KOUANDA, S.; DINGTOUMDA, I. B.; TRAORÉ, S. A. **[Evaluation of the acid-fast bacilli gradations before and after treatment of the expectorations by sodium hypochlorite in the tuberculosis diagnosis.]** *Évaluation de la densité bacillaire avant et après traitement des expectorations par l'hypochlorite de sodium dans le diagnostic de la tuberculose. Bulletin de la Societe de Pathologie Exotique* (2009) **102** (1) 1415 Paris, France; Société de Pathologie Exotique [Fr, en, 4 ref.] UFR des sciences de la vie et la terre, Université de Ouagadougou, BP 7021 Ouagadougou 03, Burkina Faso. Email: lsangare@univouaga.bf

A study was conducted to assess the impact of treatment of sputum samples with sodium hypochlorite (NaOCl) 5% on the acid-fast bacilli (AFB) gradations in the diagnosis of tuberculosis. A total of 516 sputum samples were collected from 244 patients in Burkina Faso. The sputum smears made before and after expectorations treatment with NaOCl 5% were stained using the Ziehl-Neelsen hot method. The values obtained from the two microscopic readings were compared by using the χ^2 test of McNemar. The statistical significance was set at $P < 0.05$. The results obtained before using NaOCl 5% showed that 357 samples were negative for AFB, 41 were AFB-scanty (gradation 1-9), 28 samples were AFB 1+ positive, 40 were 2+ positive and 50 were 3+ positive. After treatment, among the 357 AFB-

negative expectorations, 14 sample (3.9%) were AFB-positive, while the AFB gradation increased for 77 (48.4%) of the 159 positive specimens. The two microscopic readings differed significantly ($P=0.001$). The application of this process on a routine basis in the laboratory will require a reorganization of the tasks in order to give back results to the patients in time. It is necessary to take into account the aspect of the samples.

2330 KOFFI, S. K.; KOUASSI, A. B.; FAYE-KETTE, H.; KOUASSI-M'BENGUE, A.; AHUI, J. M. B.; AKA-DANGUY, E. **[Tuberculosis of the buccal mucosa in a patient with HIV-1 immunodeficiency.]** Tuberculose de la muqueuse buccale chez un patient immunodéprimé par le VIH-1. *Médecine et Maladies Infectieuses* (2008) **38** (3) 167-168 Paris, France; Elsevier SAS [Fr, 5 ref.] Institut Pasteur, B.P. 919, Abidjan 08, Côte d'Ivoire. Email: kofsteph@yahoo.fr

Cases of buccal (oral) mucosa or mucous membrane of the inside of cheeks, mouth or lips are rare or unknown and present diagnostic problems. Disease symptoms manifest in the form of ulceration. A case study is presented of a 38-year-old policeman admitted to the pneumology department of the hospital centre of the Cocody University in Cote d'Ivoire on 12 May 2005 with febrile polyadenopathy. Contralateral bifocal ulceration mucosarelated symptoms of the tongue and the lower lip in the hospitalised patient are outlined. Possibility of the effect of HIV-1 related immunodeficiency on development of the buccal mucosa is considered.

2331 PHYU, S.; STAVRUM, R.; THANDAR LWIN; SVENDSEN, Ø. S.; TI TI; GREWAL, H. M. S. **Predominance of *Mycobacterium tuberculosis* EAI and Beijing lineages in Yangon, Myanmar.** *Journal of Clinical Microbiology* (2009) **47** (2) 335-344 Washington, USA; American Society for Microbiology (ASM) [En, 38 ref.] The Gade Institute, Section for Microbiology and Immunology, University of Bergen, Bergen N-5021, Norway. Email: Harleen.Grewal@Gades.uib.no

Isolates of the *Mycobacterium tuberculosis* Beijing lineage are associated with high rates of transmission, hypervirulence and drug resistance. The Beijing lineage has been shown to dominate the tuberculosis (TB) epidemic in East Asia; however, the diversity and frequency of *M. tuberculosis* genotypes from Myanmar are unknown. We present the first comprehensive study describing the *M. tuberculosis* isolates circulating in Yangon, Myanmar. Thus, 310 isolates from pulmonary TB patients from Yangon, Myanmar, were genotyped by spoligotyping and IS6110-based restriction fragment length polymorphism analysis (IS6110 RFLP). The most frequent lineages observed were the East African-Indian (EAI; 48.4%; $n=150$) and Beijing (31.9%; $n=99$) lineages. Isolates belonging to the most frequent shared types (STs), ST1 ($n=98$; Beijing), ST292 ($n=28$; EAI), and ST89 ($n=11$; EAI), had $\geq 75\%$ similarity in their IS6110 patterns. Five of 11 Beijing isolates comprising five clusters with identical IS6110 RFLP patterns could be discriminated by mycobacterial interspersed repetitive-unit-variable-number tandem-repeat (MIRU-VNTR) analysis. Of the 150 EAI isolates, 40 isolates (26.7%) had only one IS6110 copy, and 17 of these isolates could be discriminated by MIRU-VNTR analysis. The findings from this study suggest that although there is a predominance of the ancient EAI lineage in Yangon, the TB epidemic in Yangon is driven by clonal expansion of the ST1 genotype. The Beijing lineage isolates (21.4%) were more likely ($P=0.009$) than EAI lineage isolates to be multidrug resistant (MDR) (1.3%; odds ratio, 3.2, adjusted for the patients' history of exposure to anti-TB drugs), suggesting that the spread of MDR Beijing isolates is a major problem in Yangon.

2332 VELARDE FÉLIX, J. S.; CÁZAREZ SALAZAR, S. G.; CASTRO VELÁZQUEZ, R.; RENDÓN MALDONADO, J. G.; RANGEL VILLALOBOS, H. **[Association between the *TaqI* polymorphism of vitamin D receptor gene and lepromatous leprosy in a Mexican population sample.]**

Relación del polimorfismo *TaqI* del gen del receptor de la vitamina D con la lepra lepromatosa en población mexicana. *Salud Pública de México* (2009) **51** (1) 59-61 Cuernavaca, Mexico; Instituto Nacional de Salud Pública [Es, en, 16 ref.] Centro de Medicina Genómica del Hospital General de Culiacán Dr. Bernardo J. Gastélum, Servicios de Salud de Sinaloa, Culiacán, Sinaloa, Mexico. Email: jsvelfe@hotmail.com

This study aimed to establish the association of the vitamin D receptor gene *TaqI* polymorphism with lepromatous leprosy (LL) in individuals from Sinaloa, Mexico. A 740-bp fragment was amplified from the VDR gene in DNA samples of 71 LL patients and 144 controls in the Hospital General de Culiacán during 2004-2007. Polymorphism was identified through *TaqI* endonuclease. A significant increase in the genotype TT of the VDR gene was observed in patients compared to controls ($P=0.040$; odds ratio (OR)=1.82). These data support the association between the TT genotype and susceptibility to LL in this Mexican population.

2333 SMITH, S. I.; OPERE, B.; GOODLUCK, H. T.; AKINDOLIRE, O. T.; FOLARANMI, A.; ODEKEYE, O. M.; OMONIGBEHIN, E. A. **Antibiotic susceptibility pattern of *Staphylococcus* species isolated from telephone receivers.** *Singapore Medical Journal* (2009) **50** (2) 208-211 Singapore, Singapore; Singapore Medical Association [En, 16 ref.] Molecular Biology and Biotechnology Division, Nigerian Institute of Medical Research, PMB 2013, Yaba, Lagos, Nigeria. Email: stellaismith@yahoo.com

Introduction: Microorganisms are transferred to everyday objects from the environment and infected individuals. Pathogenic microbes are transmissible from the air, skin, hands and other interpersonal contacts and cause diseases most of the time. This study centres on the microbial assessment of telephone receivers, their ability to transfer bacterial infections and the isolation of these microorganisms from receivers, with an

emphasis on *Staphylococcus aureus* and its antibiotic susceptibility pattern. Methods: 1.591 isolates were obtained from roadside telephone booths in 16 different locations in the Lagos metropolis. They were all characterised using the Cowan and Steel's manual, after which the antimicrobial susceptibility pattern of the most frequently-occurring isolate was determined. Results: Of all the locations, Oshodi was found to have the largest number of microorganisms, with Akoka having the least. The organisms were *Providencia*, *Klebsiella*, *Citrobacter*, *Enterobacter*, *Proteus*, *Escherichia*, *Staphylococcus*, *Bacillus*, *Streptococcus*, *Micrococcus* and yeast. *Staphylococcus* spp. was the most frequently occurring, making up 20.2 percent of the total number of isolated organisms, followed by *Bacillus* (18 percent), while *Enterobacter* and *Citrobacter* were the least common. 44 percent of the total *Staphylococcus* screened for an antimicrobial susceptibility pattern showed high resistance to most of the antibiotics used. Conclusion: This result could be related to the emergence of *Staphylococcus-resistant* strains, especially in a highly-populated area where there are health and hygiene problems and where drugs are abused. Precautions should be taken to prevent the spread of infectious diseases through the use of public telephones.

2334 KELLER, P.; MCCARTHY, K.; MOSENDANE, T.; TELLIE, M.; VENTER, F.; NOBLE, L.; SCOTT, L.; STEVENS, W.; RIE, A. VAN **HIV prevalence among medical students in Johannesburg, South Africa.** *SAMJ - South African Medical Journal* (2009) **99** (2) 72 Pretoria, South Africa; SAMA Health and Medical Publishing Group [En, 4 ref.] Department of Preventive Medicine, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina, USA

A study was conducted to determine *Mycobacterium tuberculosis* infection rates among medical students in Johannesburg, South Africa. Tuberculin skin testing (TST) as well as HIV counselling and testing (in order to interpret TST

results) were carried out. 74 of 190 (39%) 5th-year medical students invited to participate were included. None were HIV infected. The mean age of the participants was 23.9 years (median 23 years) and 55% were female. A low participation rate among medical students was observed in this study (39%). However, this was still higher compared with the 25% participation rate in another similar study conducted among physicians. The lower rate among physicians in the study by Connelly et al. and in this study among medical students may suggest that physicians and medical students are truly at lower risk compared with the general population and other health workers, or may be a biased estimate result, with only those at lowest risk choosing to participate. Further research on the participatory behaviour and prevalence of HIV among these patient groups is warranted.

2335 OM PARKASH **Classification of leprosy into multibacillary and paucibacillary groups: an analysis.** *FEMS Immunology and Medical Microbiology* (2009) **55** (1) 1-5 Oxford, UK; Blackwell Publishing [En, 37 ref.] Department of Immunology, National JALMA Institute for Leprosy and Other Mycobacterial Diseases, TajGanj, Agra, 282 001, India. Email: om1234@gmail.com

Classification of leprosy patients into multibacillary and paucibacillary determines the duration of their treatment. Misclassification leads to increased risk of relapse due to insufficient treatment if a multibacillary patient is classified as paucibacillary. This also prolongs the time the patient is infective. Over the years, the criteria used for classification (for treatment purpose) of leprosy patients have changed significantly from bacterial index measuring approach through number of skin lesions. The reliability of both of these criteria has been questioned. Several studies have shown that the presence of antibodies to the *Mycobacterium leprae*-specific antigens correlates with the bacterial load of a leprosy patient. Further, there are reports where results of serology and

bacteriological approaches have been found to agree substantially. Thus, serology seems to be a worthwhile convenient alternative tool for classification of leprosy into multibacillary or paucibacillary. Nevertheless, in view of the limitations of various classification criteria, follow-up studies are called for to understand the efficiency of various approaches in preventing relapse after treatment. The method ensuring the lowest rate of relapse could be adopted for future use in classifying these patients.

2336 XIAO JING; SUN LIN; JIAO WEIWEI; LI ZHAONA; ZHAO SHUNYING; LI HUIMIN; JIN JING; JIAO ANXIA; GUO YAJIEZAI-FANG; MOKROUSOV, I.; SHEN ADONG **Lack of association between polymorphisms in the P2X₇ gene and tuberculosis in a Chinese Han population.** *FEMS Immunology and Medical Microbiology* (2009) **55** (1) 107-111 Oxford, UK; Blackwell Publishing [En, 19 ref.] Beijing Children's Hospital affiliated to Capital Medical University, Beijing, China. Email: shenad@sohu.com

Several studies have suggested that genetic factors may affect the susceptibility of a population to tuberculosis, and it has been found that P2X₇ is linked to an increased risk for tuberculosis in some West African, Southeast Asian, North American, and North European populations. To explore the potential role of P2X₇ in the susceptibility to tuberculosis among members of the Chinese Han population, we evaluated the association of the 1513A → C and 762T → C polymorphisms in P2X₇ with the risk for tuberculosis. PCR amplification of genomic DNA was followed by restriction fragment length polymorphism analysis, and allele-specific PCR was used. We found no significant differences in the genotypic and allelic frequencies of 1513A → C polymorphisms in 96 patients with tuberculosis compared with 384 control subjects [*P*=0.856 and 0.316, respectively; odds ratio (OR) for the C allele=0.976; 95% confidence interval (CI)=0.755-1.262]. Similarly, no significant association was found between the -762T → C

polymorphism and tuberculosis ($P=0.102$ and 0.095 for the patients and controls, respectively; OR for the C allele= 0.924 ; 95% CI= $0.847-1.010$). Thus, our analysis of *P2X7* showed that the $1513A \rightarrow C$ and $-762T \rightarrow C$ polymorphisms did not appear to be associated with the susceptibility of the Chinese Han population to tuberculosis.

2337 RAJ KUBBA; BAJAJ, A. K.; THAPPA, D. M.; RAJEEV SHARMA; MAYA VEDAMURTHY; SANDIPAN DHAR; CRITON, S.; FERNANDEZ, R.; KANWAR, A. J.; UDAY KHOPKAR; MALAVIKA KOHLI; KURIYIPE, V. P.; KOUSHIK LAHIRI; NINA MADNANI; DEEPAK PARIKH; SUDHIR PUJARA; RAJABABU, K. K.; SACCHIDANAND, S.; SHARMA, V. K.; JAYAKAR THOMAS **Special Issue: Acne in India: guidelines for management - IAA consensus document.** *Indian Journal of Dermatology, Venereology & Leprology* (2009) **75** (Supplement) S1-S64 Mumbai, India; Medknow Publications [En] Kubba Clinic, 10, Aradhana Enclave, Ring Road, New Delhi - 110 066, India. Email: rajkubba@hotmail.com

The India Acne Alliance (IAA) has formulated guidelines for the treatment of acne in India with clarity of purpose, which is, to provide current overview of the various aspects of acne, to evaluate evidence for reported treatments, to do comparative analyses, and to identify and modify treatment approaches best suited for India's particular needs. This special issue contains papers exploring the epidemiology, predisposing genetic factors, hormonal and bacterial causes, pathogenesis, clinical features, complications, risk factors, treatment and prevention of acne, especially in the Indian setting. Various therapeutic options for acne, as per the IAA guidelines, are highlighted, including topical and oral retinoids, topical and oral antibiotics, synthetic hormones, and surgery. IAA hopes that the acne management guidelines will help achieve rationalization, improvement in outcomes, and more uniform therapeutic approaches.

2338 HERBINGER, K. H.; BRIESKE, D.; NITSCHKE, J.; SIEGMUND, V.; THOMPSON, W.; KLUTSE, E.; AWUA-BOATENG, N. Y.; BRUHL, E.; KUNAA, L.; SCHUNK, M.; ADJEI, O.; LÖSCHER, T.; BRETZEL, G. **Excision of pre-ulcerative forms of buruli ulcer disease: a curative treatment?** *Infection* (2009) **37** (1) 20-25 Munich, Germany; (Urban & Vogel GmbH [En, 20 ref.] Dept. of Infectious Diseases and Tropical Medicine (DITM), Ludwig-Maximilian University Munich, Leopoldstrasse 5, 80802 Munich, Germany. Email: herbinger@lrz.uni-muenchen.de

Background: Previous investigations have revealed that *Mycobacterium ulcerans* is extensively distributed spatially throughout ulcerative lesions, including in the margins of excised tissue. In contrast, bacilli in pre-ulcerative lesions are assumed to be concentrated in the center of the lesion. In order to assess the extent to which the surgical excision of pre-ulcerative lesions is capable of removing all infected tissue, we subjected the excision margins of pre-ulcerative lesions to laboratory analysis. Patients and Methods: Eleven patients with laboratory-confirmed pre-ulcerative lesions were included in the study. The diameter of the lesion and excised tissue and the "surgical distance" between the border of the lesion and excision margin were measured. The entire excision margin was cut into segments and subjected to IS2404 PCR. Results: The results from the PCR analysis on the samples of excision margins were highly significantly associated with the surgical distance ($p < 0.001$). The margin samples of nodules were significantly more often PCR positive than the plaques ($p = 0.025$). The size of the lesion and the size of the excised tissue did not significantly influence the PCR results. Statistically, a surgical distance of more than 9 mm was found to reduce the risk of remaining infected tissue to less than 10%, that of 13 mm to reduce the risk to less than 5%, and that of 25 mm to reduce the risk to nearly 0%. Conclusion: The results of this study show that in preulcerative Buruli ulcer disease, bacilli may

extend beyond the actual size of the lesion and that there is a strong correlation between the presence of *M. ulcerans* in the margin samples and the surgical distance. Excision with a surgical distance of 25 mm avoided the risk of remaining mycobacteria in this study. However, no recurrences occurred in the patients with *M. ulcerans*-positive excision margins. The need of postoperative anti mycobacterial treatment in these patients remains to be determined.

2339 ESHUN-WILSON, I.; ZEIER, M. D.; BARNES, J.; TALJAARD, J. J. **TB infection among staff at Tygerberg Academic Hospital, South Africa.** *Southern African Journal of Epidemiology & Infection* (2008) **23** (4) 17-19 Johannesburg, South Africa; South African Institute for Medical Research [En, 10 ref.] Division of Infectious Diseases, Department of Medicine, Tygerherq Academic Hospital, University of Stellenbosch, Tygerberg Campus, Francis Van Zyl Drive, Parow 7505, South Africa. Email: wil@sun.ac.za

This study was undertaken in order to characterise the occurrence, clinical spectrum and treatment outcomes of tuberculosis (TB) infection among staff at Tygerberg Academic Hospital over an 11-year period. A retrospective analysis was performed of all patients presenting to the occupational health and infectious diseases departments at the facility for the period 1 January 1996 till 31 December 2006. One hundred and thirty cases of TB were identified; 69 cases (53.1%) occurred in healthcare workers and 41 (31.5%) in ancillary hospital staff. Nursing staff were the most commonly affected healthcare worker group. There were 100 cases of pulmonary TB (76.9%) and 23 cases of extra-pulmonary TB (17.7%). HIV infection and diabetes mellitus occurred in 14 (18.2% of patients tested) and 15 (11.5%) patients, respectively. There were six cases of MDR TB; four of these occurred in diabetic staff members. This study highlights the need for improved screening and prevention of TB among hospital staff, specifically among nursing staff. Infection control policies should further

emphasise the need for protection of diabetic and HIV-infected staff members.

2340 SELVARAJ, P.; ALAGARASU, K.; SWAMINATHAN, S.; HARISHANKAR, M.; NARENDRAN, G. **CD209 gene polymorphisms in South Indian HIV and HIV - TB patients.** *Infection, Genetics and Evolution* (2009) **9** (2) 256-262 Amsterdam, Netherlands; Elsevier [En, 30 ref.] Department of Immunology, Tuberculosis Research Centre, Indian Council of Medical Research, Mayor V.R. Ramanathan Road, Chetput, Chennai 600 031, India. Email: p.selvaraj53@yahoo.com, paramasivam.selvaraj@gmail.com

Dendritic-cell-specific intercellular adhesion molecule-3 (ICAM-3)-grabbing non-integrin (DC-SIGN), a pattern recognition receptor, is associated with immune functions and is also exploited by HIV-1 and *Mycobacterium tuberculosis* as a part of their immune evasion strategy. In the present study we investigated whether variants in the DC-SIGN encoding *CD209* gene are associated with susceptibility to or protection against HIV-1 infection as well as development of tuberculosis (TB) among HIV-1 infected south Indian patients. *CD209* gene variants in the promoter region (-336 and -139), in the intron and 3'-untranslated regions (In2+11 and 2281) were studied using polymerase chain reaction-based genotyping methods in 131 HIV patients without TB (HIV+TB-) and 107 HIV patients with TB (HIV + TB+), 107 HIV negative pulmonary TB patients (HIV-PTB+) and 157 healthy controls. Results revealed a decreased frequency of -336 G/G genotype among all HIV patients compared to healthy controls and -336 G/G genotype was not observed among HIV+TB- individuals ($p=0.005$; odds ratio (OR) 0 (95% confidence intervals (CI) 0-0.46); Peto's odds ratio 0.149 (95% CI 0.045-0.50)). Among HIV+ patients, those with TB had a significantly increased frequency of -336 G/G genotype ($p=0.003$; OR undefined; Peto's odds ratio 9.8 (95% CI 2.244-3)) compared to those without TB. Other

polymorphisms were not significantly different between the various study groups. The results suggest that -336 G/G genotype while associated with protection against HIV -1 infection the same genotype is also associated with susceptibility to HIV - TB among south Indians.

2341 Buruli ulcer: first programme review meeting for west Africa - summary report. *Weekly Epidemiological Record* (2009) **84** (6) 43-48 Geneva, Switzerland; World Health Organization [En, Fr]

This report summarizes the current status of the Buruli ulcer control programme implemented in several West African countries, including Benin, Cote d'Ivoire, Ghana, Nigeria and Togo. Overall conclusions drawn from the individual reports are presented, and specific recommendations for programme improvements are discussed.

2342 MOGHADERI, A.; ALAVI-NAINI, R.; IZADI, S.; CUEVAS, L. E. **Diagnostic risk factors to differentiate tuberculous and acute bacterial meningitis.** *Scandinavian Journal of Infectious Diseases* (2009) **41** (3) 188-194 Stockholm, Sweden; Informa Healthcare [En, 21 ref.] Neurology Department, Zahedan University of Medical Sciences, Khatam Teaching Hospital, Zahedan, 9815733169, Iran. Email: moghtaderi@zdmu.ac.ir

The objective of this study was to identify independent predictor factors for diagnosis of tuberculous meningitis and develop a clinical prediction tool based upon a set of simple clinical and laboratory parameters in our local population. Clinical and laboratory features were compared in 68 patients with tuberculous meningitis and 123 cases of acute bacterial meningitis in 3 referral centres for tuberculosis in south-eastern Iran. Twenty-two clinical and laboratory features were analysed. Based on the best-fitted model a receiver operating characteristic curve with the highest surface under the curve was constructed. Disease duration before diagnosis (≥ 5 d) had the highest odds ratio of 21.9. Age over 30 y, CSF leukocyte

count $\leq 1000 \times 10^3$) cells/ml and CSF lymphocytosis $\geq 70\%$ were placed after disease duration with odds ratios of 5.1, 3.7 and 2.6, respectively. Sensitivity, specificity and likelihood ratio for a positive test in this model were 84%, 88% and 7.4, respectively. The area under the ROC curve was 0.92. It appears that a single model can not predict TBM diagnosis in different populations. Using clinical and laboratory parameters may facilitate empirical diagnosis of TBM in endemically low income countries with limited microbiological diagnostic facilities.

2343 GOLUB, J. E.; PRONYK, P.; MOHAPI, L.; THSABANGU, N.; MOSHABELA, M.; STRUTHERS, H.; GRAY, G. E.; MCINTYRE, J. A.; CHAISSON, R. E.; MARTINSON, N. A. **Isoniazid preventive therapy, HAART and tuberculosis risk in HIV-infected adults in South Africa: a prospective cohort.** *AIDS* (2009) **23** (5) 631-636 Hagerstown, USA; Lippincott Williams & Wilkins [En, 27 ref.] School of Medicine, Johns Hopkins University, 1550 Orleans St., 1M.07 Baltimore, MD 21231, USA. Email: jgolub@jhmi.edu

Background: The World Health Organization recommends isoniazid preventive therapy (IPT) for preventing tuberculosis in HIV-infected adults, although few countries have instituted this policy. Both IPT and highly active antiretroviral therapy (HAART) used separately result in reductions in tuberculosis risk. There is less information on the combined effect of IPT and HAART. We assessed the effect of IPT, HAART or both IPT and HAART on tuberculosis incidence in HIV-infected adults in South Africa. Methods: Two clinical cohorts of HIV-infected patients were studied. Primary exposures were receipt of IPT and/or HAART and the primary outcome was incident tuberculosis. Crude incident rates and incident rate ratios were calculated and Cox proportional hazards models investigated associations with tuberculosis risk. Results: Among 2778 HIV-infected patients followed for 4287 person-years, 267 incident tuberculosis cases were diagnosed [incidence rate ratio (IRR)=6.2/100 person-years; 95% CI 5.5-

7.0]. For person-time without IPT or HAART, the IRR was 7.1/100 person-years (95% CI 6.2-8.2); for person-time receiving HAART but without IPT, the IRR was 4.6/100 person-years (95% CI 3.4-6.2); for person-time after IPT but prior to HAART, the IRR was 5.2/100 person-years (95% CI 3.4-7.8); during follow-up in patients treated with HAART after receiving IPT the IRR was 1.1/100 person-years (95% CI 0.02-7.6). Compared to treatment-naïve patients, HAART-only patients had a 64% decreased hazard for tuberculosis [adjusted hazard ratio (aHR)=0.36; 95% CI 0.25-0.51], and patients receiving HAART after IPT had a 89% reduced hazard (aHR=0.11; 95% CI 0.02-0.78). Conclusion: Tuberculosis risk is significantly reduced by IPT in HAART-treated adults in a high-incidence operational setting in South Africa. IPT is an inexpensive and cost-effective strategy and our data strengthen calls for the implementation of IPT in conjunction with the roll-out of HAART.

2344 NIYAZ AHMED; EHTESHAM, N. Z.; HASNAIN, S. E. **Ancestral *Mycobacterium tuberculosis* genotypes in India: implications for TB control programmes.** *Infection, Genetics and Evolution* (2009) **9** (1) 142-146 Amsterdam, Netherlands; Elsevier [En, many ref.] Pathogen Evolution Laboratory, Centre for DNA Fingerprinting and Diagnostics (CDFD), Nacharam, Hyderabad, India. Email: seh@uohyd.ernet.in

It has been a decade since the genome sequence of *Mycobacterium tuberculosis* was unraveled. The fruits of genomic technologies are yet to reach high burden countries such as India, where tuberculosis (TB) kills a huge number of patients. Paradoxically, despite increased cases of human immunodeficiency virus (HIV) infection and diabetes mellitus, TB cure rates in India have been consistently improving during the DOTS program. Does this mean that the underlying TB bacilli are somehow 'co-operating' with the TB control program implementers? Genotypic analyses of the tubercle bacilli have identified a predominance of ancestral strains of *M.*

tuberculosis in major parts of India in addition to various other lineages of modern evolutionary descent. Virulence and dissemination potentials of these ancestral strains are speculated to be 'low' as compared to the other 'aggressive' strains such as Beijing and LAM, which are expected to be more widespread in future, also in synergy with HIV and diabetes epidemics. We discuss the implications of the high prevalence of ancestral strains on TB control in India. It appears that despite a hypothetical 'ancestral advantage', future dynamics of tubercle bacilli in the backdrop of surging HIV and diabetes incidences may pose a major healthcare problem in India in the years to come.

2345 JABER, A.; AHMAD, S.; MOKADDAS, E. **Minor contribution of mutations at *iniA* codon 501 and *embC-embA* intergenic region in ethambutol-resistant clinical *Mycobacterium tuberculosis* isolates in Kuwait.** *Annals of Clinical Microbiology and Antimicrobials* (2009) **8** (2) (15 January 2009) London, UK; BioMed Central Ltd [En, 34 ref.] Department of Microbiology, Faculty of Medicine, Kuwait University, Kuwait City, Kuwait. Email: Gad1978@hotmail.com., suhail_ah@hsc.edu.kw. e.mokaddas@hsc.edu.kw

Background: Ethambutol (EMB) is a first-line drug for the treatment of tuberculosis (TB). Resistance to EMB in *Mycobacterium tuberculosis* isolates is mediated by mutations in several genes involved in arabinan synthesis notably three *emb* (arabinosyl transferase) and *iniA* (isoniazid-inducible) genes. Most epidemiologically unrelated EMB-resistant *M. tuberculosis* strains contain mutations at *embB* codons 306, 406 and 497, *embC-embA* intergenic region (IGR) and *iniA* codon 501 (*iniA501*). Objective: To develop a more comprehensive molecular screen for EMB-resistance detection among epidemiologically unrelated EMB-resistant *M. tuberculosis* strains previously analyzed for *embB* codon 306, 406 and 497 mutations by including analysis of mutations at *iniA501* and in *embC-embA* IGR. Methods: Fifty

consecutive and phenotypically documented EMB-resistant and 25 pan susceptible *M. tuberculosis* strains isolated from 75 different TB patients over a four-year period in Kuwait were analyzed. Mutations at *iniA501* were detected by PCR amplification followed by restriction fragment length polymorphism (RFLP) patterns generated with *Hpy 99 I*. Direct DNA sequencing was used to confirm RFLP results and for detecting mutations in *embC-embA* IGR. Results: Nearly same number of EMB-resistant *M. tuberculosis* strains were resistant to EMB alone and EMB together with additional resistance to rifampicin and isoniazid (9 of 50, 18% and 11 of 50, 22%, respectively). All the 25 pan susceptible strains contained wild-type sequences at *iniA501* and in *embC-embA* IGR. The analysis of 50 EMB-resistant *M. tuberculosis* isolates showed that only one strain contained a mutated *iniA501* while no mutation was detected in *embC-embA* IGR in any of the isolate. Conclusion: Analysis of *iniA501* and *embC-embA* IGR in epidemiologically unrelated EMB-resistant *M. tuberculosis* isolates in Kuwait indicate that mutations at these locations occur very infrequently and their inclusion for the development of a comprehensive molecular screen will make only minor contribution towards rapid EMB resistance detection.

2346 HE GUANGXUE; ZHAO YANLIN; JIANG GUANGLU; LIU YUHONG; XIA HUI; WANG SHENGFEN; WANG LJIA; BORGDORFF, M. W.; WERF, M. J. VAN DER; HOF, S. VAN DEN
Prevalence of tuberculosis drug resistance in 10 provinces of China. *BMC Infectious Diseases* (2008) **8** (166) (11 December 2008) London, UK; BioMed Central Ltd [En, 18 ref.] National Center for TB control and prevention, China Center for Disease Control and Prevention (CDC), Beijing, China. Email: heguangxue@chinatb.org, zhaoyanlin@tb123.org, guanglu0725@126.com, Liuyu@wpro.who.int, xiahuibj@126.com, wangsh-engfen@gmail.com, wanglx@chinatb.org, borgdorffm@kncvtbc.nl, vanderwerfm@kncvtbc.nl, vandenhofs@kncvtbc.nl

Background: The emergence of drug-resistant tuberculosis (TB) hampers TB control. Ten provinces in China performed drug resistance surveys among tuberculosis (TB) patients in 1996-2004 to assess levels of drug resistance. Methods: Provincial drug resistance surveys included all isolates from newly diagnosed, smear-positive TB patients. Drug susceptibility testing (DST) against isoniazid, rifampicin, streptomycin and ethambutol was carried out in the provincial laboratories. For purposes of quality assurance, a random sample (11.6%) was re-tested by the national reference laboratory (NRL). Results: Of 14,059 patients tested 11,052 (79%) were new TB cases. The weighted mean prevalence of multi-drug resistant tuberculosis (MDR-TB) among all cases was 9.3% (range 2.2%-10.4%); 5.4% (range 2.1%-10.4%) among new cases and 25.6% (range 11.7%-36.9%) among previously treated cases. Adjusting the drug resistance proportions using the re-testing results did not change the estimated national mean prevalence significantly. However, in some individual provinces the estimated resistance proportions were greatly influenced, especially among re-treatment patients. Conclusion: MDR-TB levels varied greatly between provinces in China, but on average were high compared to the global estimated average of 4.8%. This study shows the importance of quality-assured laboratory performance. Programmatic management of drug-resistant TB, including high quality DST for patients at high risk of resistance and treatment with second-line drugs, should become the standard, especially in high MDR-TB settings.

2347 DOU HORNGYUNN; TSENG FANCHEN; LIN CHIHWEI; CHANG JIARU; SUN JUNREN; TSAI WENSHING; LEE SHIYI; SU IHJEN; LU JANGJIH
Molecular epidemiology and evolutionary genetics of *Mycobacterium tuberculosis* in Taipei. *BMC Infectious Diseases* (2008) **8** (170) (22 December 2008) London, UK; BioMed Central Ltd [En, 52 ref.] Division of Clinical Research, National Health Research Institutes, Zhunan, 35 Keyan Road, Zhunan, Miaoli County 350, Taiwan. Email:

hydou@nhri.org.tw, 950119@nhri.org.tw, chihwei@nhri.org.tw, jrchang@nhri.org.tw, sun3342@yahoo.com.tw, glory_sing@yahoo.com.tw, ecm318@mail.ndmctsgh.edu.tw, suihjen@nhri.org.tw, jj1@ndmctsgh.edu.tw

Background: The control of tuberculosis in densely populated cities is complicated by close human-to-human contacts and potential transmission of pathogens from multiple sources. We conducted a molecular epidemiologic analysis of 356 *Mycobacterium tuberculosis* (MTB) isolates from patients presenting pulmonary tuberculosis in metropolitan Taipei. Classical anti-biogram studies and genetic characterization, using mycobacterial interspersed repetitive-unit-variable-number tandem-repeat (MIRU-VNTR) typing and spoligotyping, were applied after culture. **Methods:** A total of 356 isolates were genotyped by standard spoligotyping and the strains were compared with in the international spoligotyping database (SpolDB4). All isolates were also categorized using the 15 loci MIRU-VNTR typing method and combin with *NTF* locus and RD deletion analyses. **Results:** Of 356 isolates spoligotyped, 290 (81.4%) displayed known spoligotypes and 66 were not identified in the database. Major spoligotypes found were Beijing lineages (52.5%), followed by Haarlem lineages (13.5%) and EAI plus EAI-like lineages (11%). When MIRU-VNTR was employed, 140 patterns were identified, including 36 clusters by 252 isolates and 104 unique patterns, and the largest cluster comprised 95 isolates from the Beijing family. The combination of spoligotyping and MIRU-VNTR revealed that 236 (67%) of the 356 isolates were clustered in 43 genotypes. Strains of the Beijing family was more likely to be of modern strain and a higher percentage of multiple drug resistance than other families combined ($P=0.08$). Patients infected with Beijing strains were younger than those with other strains (mean 58.7 vs. 64.2, $p=0.02$). Moreover, 85.3% of infected persons younger than 25 years had Beijing modern strain, suggesting a possible recent

spread in the young population by this family of TB strain in Taipei. **Conclusion:** Our data on MTB genotype in Taipei suggest that MTB infection has not been optimally controlled. Control efforts should be reinforced in view of the high prevalence of the Beijing strain in young population and association with drug resistance.

2348 MAHNAZ TANVEER; ZAHRA HASAN; SIDDIQUI, A. R.; ASHO ALI; AKBAR KANJI; GHEBREMICHEAL, S.; RUMINA HASAN **Genotyping and drug resistance patterns of *M. tuberculosis* strains in Pakistan.** *BMC Infectious Diseases* (2008) **8** (171) (24 December 2008) London, UK; BioMed Central Ltd [En, 54 ref.] Department of Pathology and Microbiology, The Aga Khan University, Stadium Road, Karachi, Pakistan. Email: mahnaz.tanveer@aku.edu, maqboola.dojki@aku.edu, rehana.siddiqui@aku.edu, asho.ali@aku.edu, akbar.kanji@aku.edu, solomon.ghebremicheal@smi.ki.se, rumina.hasan@gmail.com

Background: The incidence of tuberculosis in Pakistan is 181/ 100,000 population. However, information about transmission and geographical prevalence of *Mycobacterium tuberculosis* strains and their evolutionary genetics as well as drug resistance remains limited. Our objective was to determine the clonal composition, evolutionary genetics and drug resistance of *M. tuberculosis* isolates from different regions of the country. **Methods:** *M. tuberculosis* strains isolated (2003-2005) from specimens submitted to the laboratory through collection units nationwide were included. Drug susceptibility was performed and strains were spoligotyped. **Results:** Of 926 *M. tuberculosis* strains studied, 721(78%) were grouped into 59 "shared types", while 205 (22%) were identified as "Orphan" spoligotypes. Amongst the predominant genotypes 61 % were Central Asian strains (CAS; including CAS1, CAS sub-families and Orphan Pak clusters), 4% East African-Indian (EAI), 3% Beijing, 2% poorly defined TB strains (T), 2% Haarlem and LAM (0.2). Also TbD1 analysis (*M. tuberculosis* specific deletion 1) confirmed that CAS1 was of "modern"

origin while EAI isolates belonged to “ancestral” strain types. Prevalence of CAS1 clade was significantly higher in Punjab ($P < 0.01$, Pearson's Chi-square test) as compared with Sindh, North West Frontier Province and Balochistan provinces. Forty six percent of isolates were sensitive to five first line antibiotics tested, 45% were Rifampicin resistant, 50% isoniazid resistant. MDR was significantly associated with Beijing strains ($P = 0.01$, Pearson's Chi-square test) and EAI ($P = 0.001$, Pearson's Chi-square test), but not with CAS family. Conclusion: Our results show variation of prevalent *M. tuberculosis* strain with greater association of CAS1 with the Punjab province. The fact that the prevalent CAS genotype was not associated with drug resistance is encouraging. It further suggests a more effective treatment and control programme should be successful in reducing the tuberculosis burden in Pakistan.

2349 KRITZINGER, F. E.; BOON, S. DEN; VERVER, S.; ENARSON, D. A.; LOMBARD, C. J.; BORG DORFF, M. W.; GIE, R. P.; BEYERS, N. **No decrease in annual risk of tuberculosis infection in endemic area in Cape Town, South Africa.** *Tropical Medicine and International Health* (2009) **14** (2) 136-142 Oxford, UK; Blackwell Publishing [En, fr, es, 32 ref.] Desmond Tutu TB Centre, Stellenbosch University, Cape Town, South Africa. Email: sdenboon@muucsf.org, saskiadenboon@hotmail.com

Objective: To estimate the change in annual risk of tuberculosis infection (ARTI) in two neighbouring urban communities of Cape Town, South Africa with an HIV prevalence of approximately 2%, and to compare ARTI with notification rates and treatment outcomes in the tuberculosis (TB) programme. Methods: In 1998-1999 and 2005, tuberculin skin test surveys were conducted to measure the prevalence of *Mycobacterium tuberculosis* infection and to calculate the ARTI. All 6 to 9-year-old children from all primary schools were included in the survey. Notification rates and treatment

outcomes were obtained from the TB register. Results: A total of 2067 children participated in the survey from 1998 to 1999 and a total of 1954 in 2005. Based on a tuberculin skin test cut-off point of 10 mm, the ARTI was 3.7% (3.4-4.0%) in the 1998-1999 survey and 4.1% (3.8-4.5%) in 2005. The notification rate for pulmonary TB increased significantly from 646 per 100 000 in 1998 to 784 per 100 000 in 2002. In Ravensmead, there was no significant change in ARTI [first survey: 3.5% (3.1-3.9%), second survey: 3.2% (2.9-3.6%)], but in Uitsig the ARTI increased significantly from 4.1% (3.6-4.6%) to 5.8% (5.2-6.5%). The difference in ARTI between the two areas was associated with differences in reported case rates and the proportion of previously treated cases. Conclusion: Tuberculosis transmission remains very high in these two communities and control measures to date have failed. Additional measures to control TB are needed.

2350 GEETHA RAMACHANDRAN; KUMAR, A. K. H.; SIKHAMANI RAJASEKARAN; KUMAR, P.; RAMESH, K.; ANITHA, S.; NARENDRAN, G.; PRADEEP MENON; GOMATHI, C.; SOUMYA SWAMINATHAN **CYP2B6 G516T polymorphism but not rifampin coadministration influences steady-state pharmacokinetics of efavirenz in human immunodeficiency virus-infected patients in South India.** *Antimicrobial Agents and Chemotherapy* (2009) **53** (3) 863-868 Washington, USA; American Society for Microbiology (ASM) [En, 40 ref.] Department of Clinical Research, Tuberculosis Research Centre (Indian Council of Medical Research), Mayor V. R. Ramanathan Road, Chetput, Chennai-600 031, India. Email: doctorsoumya@yahoo.com

The dose of efavirenz during concomitant rifampin (RMP) administration is a matter of debate. We studied the influence of RMP coadministration on the steady-state pharmacokinetics of efavirenz in human immunodeficiency virus type 1 (HIV-1)-infected patients in South India. Fifty-seven HIV-tuberculosis (TB)-coinfecting and 15 HIV-1-

infected patients receiving combination antiretroviral therapy (CART) with an efavirenz (600 mg once daily)-containing regimen were recruited. HIV-TB-coinfected patients were receiving treatment with RMP-containing regimens. A complete pharmacokinetic study was conducted with 19 HIV-TB patients on two occasions (with and without RMP). Trough concentrations of efavirenz were measured in the remaining 38 patients during RMP coadministration. The 15 HIV-infected patients underwent complete pharmacokinetic sampling on one occasion. Plasma efavirenz was estimated by high-performance liquid chromatography, and genotyping of *CYP2B6* G516T polymorphism was performed by sequencing. Peak and trough concentrations and exposure to efavirenz were significantly higher in TT than in GT and GG genotype patients ($P < 0.001$). Although RMP coadministration decreased the peak and trough concentrations and exposure to efavirenz by 17.8, 20.4, and 18.6%, respectively, the differences were not statistically significant. The trough concentration of efavirenz was subtherapeutic (less than 1.0 $\mu\text{g/ml}$) in 6 (8%) of 72 patients. In this South Indian population of HIV-infected patients, *CYP2B6* G516T polymorphism but not RMP coadministration significantly influenced the pharmacokinetics of efavirenz; patients with the TT genotype had very high blood levels of efavirenz. While a small proportion of patients had subtherapeutic efavirenz levels, the clinical implications are uncertain, as all had good immunological responses to CART.

2351 WESTREICH, D.; MACPHAIL, P.; RIE, A. VAN; MALOPEKGOKONG, B.; IVE, P.; RUBEL, D.; BOULME, R.; ERON, J.; SANNE, I. **Effect of pulmonary tuberculosis on mortality in patients receiving HAART.** *AIDS* (2009) **23** (6) 707-715 Hagerstown, USA; Lippincott Williams & Wilkins [En, 36 ref.] Department of Epidemiology, Gillings School of Global Public Health, University of North Carolina, CB#7435, McGavran-Greenberg Hall, Chapel Hill, NC 27599-7435, USA. Email: djw@unc.edu

Objective: To estimate the effect of ongoing treatment for pulmonary tuberculosis (PTB) at time of initiation of HAART on subsequent risk of death. Design: Evaluation of an open cohort of 7512 patients who initiated HAART between April 2004 and March 2007 in the Themba Lethu Clinic in Johannesburg, South Africa. Methods: Mortality hazard ratios were estimated using marginal structural Cox proportional hazards models to control for bias due to both confounding and loss to follow-up. Extensive sensitivity and secondary analyses were performed. Results: Although the crude hazard ratio for mortality in HAART-treated patients comparing those with and without treated PTB was 1.71 (95% confidence interval 1.31-2.23), the adjusted hazard ratio was 1.06 (95% confidence interval 0.75-1.49), indicating no difference in mortality risk. Similar effects were found when we considered different durations of time between initiation of PTB treatment and HAART, and sensitivity analysis confirmed main results. Secondary analysis suggested that individuals with PTB and other risk factors for death might be at particularly high risk of death during HAART treatment. Conclusion: The increase in death that we observed among individuals with PTB at the time of HAART initiation appears not to be due to the presence of PTB, but instead to confounding factors such as low CD4 cell count, low BMI, and WHO stage IV disease. These results further demonstrate that initiation of HAART soon after initiation of PTB treatment is not likely to put patients at higher risk of death.

2352 LEE, L. N.; CHOU, C. H.; WANG, J. Y.; HSU, H. L.; TSAI, T. H.; JAN, I. S.; HSUEH, P. R.; YANG, P. C. **Enzyme-linked immunospot assay for interferon-gamma in the diagnosis of tuberculous pleurisy.** *Clinical Microbiology and Infection* (2009) **15** (2) 173-179 Oxford, UK; Blackwell Publishing [En, 40 ref.] Department of Laboratory Medicine, National Taiwan University College of Medicine, National Taiwan University Hospital, No. 7 Chung-Shan South Road, Taipei 100, Taiwan. Email: hsporen@ntu.edu.tw

Patients presenting with pleural effusion of undetermined aetiology were prospectively enrolled, and an enzyme-linked immunospot (ELISPOT) assay on pleural fluid and peripheral blood was performed. Forty patients were studied, including 19 with culture- or biopsy-confirmed ($n=15$) or clinically compatible ($n=4$) tuberculous pleurisy, and 21 with pleural effusions due to non-tuberculous causes. The sensitivity, specificity and positive and negative predictive values of the assay were 94.7%, 85.7%, 85.7% and 94.7%, respectively, on pleural fluid, and 77.8%, 90.5%, 87.5% and 82.6%, respectively, on blood. Antigen-specific, interferon-gamma-secreting T-cells were concentrated eight to ten times in pleural fluid as compared with blood. Among the seven patients not suitable for pleural biopsy and three patients whose biopsy results were non-diagnostic, nine had positive ELISPOT result with pleural fluid. The ELISPOT assay for interferon-gamma can accurately diagnose tuberculous pleurisy and is helpful for patients not suitable for pleural biopsy and those whose biopsy results are non-diagnostic.

2353 FRED, D.; EKIEK, M.; PAVLIN, B.; BROSTROM, R.; HADDAD, M.; BAMRAH, S.; HEETDERKS, A.; DESAI, M.; SONG, R. **Two simultaneous outbreaks of multidrug-resistant tuberculosis Federated States of Micronesia, 2007-2009.** *Morbidity and Mortality Weekly Report* (2009) **58** (10) 253-256 Atlanta, USA; Epidemiology Program Office, Centers for Disease Control and Prevention (CDC) [En, 10 ref.] Chuuk TB Control Program, National Center for Viral Hepatitis, HIV/AIDS, STD, and TB Prevention, Centers for Disease Control and Prevention (CDC), 1600 Clifton Rd., Atlanta, GA 30333, USA.

In July 2008, CDC responded to a request from the Federated States of Micronesia (FSM) to investigate the first documented cases of multidrug-resistant tuberculosis (MDRTB) in Chuuk State. Compared with drug-susceptible TB disease, MDRTB is resistant to at least isoniazid and rifampin, the two most effective TB medications, making treatment more difficult

and outcomes more likely fatal. Second-line TB drugs for treating MDRTB were not available in FSM, and during December 2007-June 2008 four patients with MDRTB had died, including a child aged 2 years. This report describes the investigation by the WHO and CDC, which initially identified five confirmed cases in two distinct clusters, characterized by two distinct geographic locations, genotypes, and drug-susceptibility patterns. Extensive transmission has occurred among household contacts; 16 (8%) of the 205 contacts identified have confirmed or suspected MDRTB disease, and 124 (60%) have latent TB infection. Among 21 confirmed and suspected cases of MDRTB identified as of 13 March 2009, ten have been in persons aged <15 years. With the death of a child aged 4 years in November 2008, a total of five persons have died of MDRTB. Multiple U.S. government agencies and other organizations are assisting local health authorities with resources to procure second-line TB drugs, ensure directly observed therapy, and identify and evaluate contacts. These simultaneous and continuing outbreaks demonstrate how a lack of basic TB control activities can allow the emergence and spread of drug-resistant TB.

2354 MURHEKAR, M. V.; SAILAJA BITRAGUNTA; YVAN HUTIN; ANITA CKAKRAVARTY; SHARMA, H. J.; GUPTA, M. D. **Immunization coverage and immunity to diphtheria and tetanus among children in Hyderabad, India.** *Journal of Infection* (2009) **58** (3) 191-196 Amsterdam, Netherlands; Elsevier [En, 13 ref.] Field Epidemiology Training Programme, National Institute of Epidemiology, R-127, TNHB, Ayapakkam, Ambattur, Chennai-600 070, India.

Background: The Indian state of Andhra Pradesh accounted for 50% diphtheria and 3% tetanus cases reported globally during 2005. During 2003-2006, there was a rising trend of diphtheria in Hyderabad, the state capital, whereas there was no major change in trend of tetanus cases. We estimated coverage of diphtheria and tetanus vaccine among children aged ≤ 6 years and

immunity against these diseases among school children aged 7-17 years in Hyderabad. Methods: Using lot quality assurance sampling method, we surveyed children aged 12-23, 18-36 and 54-72 months to estimate coverage of three primary doses and first and second boosters of diphtheria and tetanus vaccine respectively. We conducted a sero-survey among children aged 7-17 years studying in randomly selected schools in Hyderabad. We tested sera for antibodies against diphtheria and tetanus. Results: Primary vaccination coverage was <80% in four of the seven circles of Hyderabad while booster coverage was <80% in entire city. Of the 2419 children sero-surveyed, 56% and 64% were immune to diphtheria and tetanus respectively (titre ≥ 0.1 IU/ml). Booster coverage and immunity against these diseases was lower among Muslims. Conclusions: It is necessary to improve booster coverage especially among Muslims. Vaccinating school children at school entry and periodic boosters thereafter will increase immunity among children.

2355 ASIIMWE, B. B.; JOLOBA, M. L.; GHEBREMICHAEL, S.; KOIVULA, T.; KATEETE, D. P.; KATABAZI, F. A.; PENNHAG, A.; PETERSSON, R.; KALLENIIUS, G. **DNA restriction fragment length polymorphism analysis of *Mycobacterium tuberculosis* isolates from HIV-seropositive and HIV-seronegative patients in Kampala, Uganda.** *BMC Infectious Diseases* (2009) **9** (12) (5 February 2009) London, UK; BioMed Central Ltd [En, 25 ref.] Department of Microbiology, Tumor and Cell Biology, Karolinska Institutet, SE-171 77, Stockholm, Sweden. Email: benon.asiimwe@ki.se, m1j_10@cwru.edu, solomon.ghebremichael@smi.se, tuija.koivula@smi.se, dkateete@med.mak.ac.ug, ashbaf2000@yahoo.com, alexandra.pennhag@smi.se, ramona.petersson@smi.se, gunilla.kallenius@smi.se

Background: The identification and differentiation of strains of *Mycobacterium tuberculosis* by DNA fingerprinting has provided a better

understanding of the epidemiology and tracing the transmission of tuberculosis. We set out to determine if there was a relationship between the risk of belonging to a group of tuberculosis patients with identical mycobacterial DNA fingerprint patterns and the mv sero-status of the individuals in a high TB incidence peri-urban setting of Kampala, Uganda. Methods: One hundred eighty three isolates of *Mycobacterium tuberculosis* from 80 HIV seropositive and 103 HIV seronegative patients were fingerprinted by standard IS6110-RFLP. Using the BioNumerics software, strains were considered to be clustered if at least one other patient had an isolate with identical RFLP pattern. Results: One hundred and eighteen different fingerprint patterns were obtained from the 183 isolates. There were 34 clusters containing 54% (99/183) of the patients (average cluster size of 2.9), and a majority (96.2%) of the strains possessed a high copy number (≥ 5 copies) of the IS6110 element. When strains with <5 bands were excluded from the analysis, 50.3% (92/183) were clustered, and there was no difference in the level of diversity of DNA fingerprints observed in the two serogroups (adjusted odds ratio [aOR] 0.85, 95%CI 0.46-1.56, $P=0.615$), patients aged <40 years (aOR 0.53, 95%CI 0.25-1.12, $P=0.100$), and sex (aOR 1.12, 95%CI 0.60-2.06, $P=0.715$). Conclusion: The sample showed evidence of a high prevalence of recent transmission with a high average cluster size, but infection with an isolate with a fingerprint found to be part of a cluster was not associated with any demographic or clinical characteristics, including mv status.

2356 ZHANG, R. X.; FAN, A. Y.; ZHOU, A. N.; MOUDGIL, K. D.; MA, Z. Z.; LEE, D. Y. W.; FONG, H. H. S.; BERMAN, B. M.; LAO, L. X. **Extract of the Chinese herbal formula *Huo Luo Kiao Ling Dan* inhibited adjuvant arthritis in rats.** *Journal of Ethnopharmacology* (2009) **121** (3) 366-371 Amsterdam, Netherlands; Elsevier [En, 36 ref.] Center for Integrative Medicine, School of Medicine, University of Maryland, 3rd Floor,

James Kernan Hospital Man., 2200 Kernan Drive, Baltimore, MD 21207, USA. Email: LLao@compmed.umm.edu

Ethnopharmacological relevance: The herbal formula *Huo Luo Kiao Ling Dan* (HLXL) and its modifications have been used in traditional Chinese medicine for about one hundred years to alleviate pain and inflammation. Aim: To investigate the effects of HLXL on complete Freund's adjuvant (CFA)-induced multiple-joint arthritis in rats. Materials and methods: Male Lewis rats, 190-210 g, were immunized subcutaneously at the base of the tail with 200 μ l of heat-killed *Mycobacterium tuberculosis* in mineral oil (5 mg/ml). HLXL (2.30 and 4.60 g/kg) or vehicle control ($n=8$ per group) was administered orally (i.g.) once a day between days 16 and 25 post- CFA injection. The rats were observed for signs of arthritis with arthritic changes (erythema, edema, induration) being scored on a scale of 0-4 of increasing severity using a standard scoring system. The maximum

arthritis score per rat was 16. A plethysmometer was used to measure edema volume in each paw. Adverse effects of HLXL were monitored by closely observing the animals for unusual behavioral changes. Levels of tumor necrosis factor alpha (TNF- α) and interleukin-1 beta (IL-1 β) in local tissue were measured by enzyme-linked immunosorbent assay on day 25 post-CFA. Results: HLXL significantly decreased arthritis scores between days 23-25 in the 2.30 g/kg group and 21-25 in the 4.60 g/kg group ($p<0.05$). It reduced paw edema on days 22 and 24 in the 2.30 g/kg group and on days 20, 22 and 24 in the 4.60 g/kg group compared to control ($p<0.05$). Local tissue TNF- α and IL-1 β levels on day 25 post-CFA injection were significantly ($p<0.05$) lower in rats treated with HLXL than in control rats. No observable adverse effects were found. Conclusion: The data suggest that HLXL produces significant anti-arthritic effects that may be mediated by suppressing pro-inflammatory cytokines, and it appears to be safe.