

REFERENCES

Ahmad A., Afghan S., Raykundalia C., and Catty D. (1998). Diagnosis of tuberculosis by using enzyme-linked immunosorbent assay (ELISA) to detect anti-mycobacterial superoxide dismutase antibodies in the patients. *Med J Islamic Acad Sci.* **11(1)**: 1 – 5.

Al Dulayymi J.R., Baird M.S., and Roberts E. (2005). The synthesis of a single enantiomer of a major α -mycolic acid of *M. tuberculosis*. *Tetrahedron* **61**: 11939 – 11951.

Al Dulayymi J.R., Baird M.S., Roberts E., Deysel M., and Verschoor J. (2007). The first syntheses of single enantiomers of the major methoxymycolic acid of *Mycobacterium tuberculosis*. *Tetrahedron* **63**: 2571 – 2592.

Albay A., Kisa O., Baylan O., and Doganci L. (2003). The evaluation of FASTPlaqueTB™ test for the rapid diagnosis of tuberculosis. *Diagn Microbiol Infect Dis.* **46**: 211 – 215.

Altin J.G., White F.A.J., and Easton C. (2001). Synthesis of the chelator lipid nitrilotriacetic acid ditetradecylamine (NTA-DTDA) and its use with the IA sys biosensor to study receptor-ligand interactions on model membranes. *Biochim Biophys Acta* **1513**: 131 – 148.

Alving C.R., and Wassef N.M. (1999). Naturally occurring antibodies to cholesterol: a new theory of LDL cholesterol metabolism. *Immunol Today* **20(8)**: 362 – 366.

Anderson P., Munk M.E., Pollock J.M., and Doherty T.M. (2000). Specific immune-based diagnosis of tuberculosis. *Lancet* **356**: 1099 – 1104.

Antunes A., Nina J., and David S. (2002). Serological screening for tuberculosis in the community: an evaluation of the Mycodot procedure in an African population with high HIV-2 prevalence (Republic of Guinea-Bissau). *Res Microbiol.* **153**: 301 – 305.

- Arya S.K., Solanki P.R., Singh R.P., Pandey M.K., Datta M., and Malhotra B.D. (2006). Application of octadecanethiol self-assembled monolayer to cholesterol biosensor based on surface plasmon resonance technique. *Talanta* **69**: 918 – 926.
- Attallah A.M., Osman, S., Saad, A., Omran, M., Ismail, H., Ibrahim, G., and Abo-Naglla, A. (2005). Application of a circulating antigen detection immunoassay for laboratory diagnosis of extra-pulmonary and pulmonary tuberculosis. *Clin Chim Acta* **356**: 58 – 66.
- Ayela C., Roguet F., Valera L., Granier C., Nicu L., and Pugnieri M. (2007). Antibody-antigenic peptide interactions monitored by SPR and QCM-D a model for SPR detection of IA-2 autoantibodies in human serum. *Biosens Bioelectron.* **27**: 3113 – 3119.
- Beckman E.V., Porcelli S.A., Morita C.T. Behar S.M., Furlong S.T., and Brenner M.B. (1994). Recognition of a lipid antigen by CD1-restricted $\alpha\beta^+$ T cells. *Nature* **372**: 691 – 694.
- Bellen A.L., Concepcion R.M.T., Montoya J., and Mendoza M.T. (2003). Accuracy of a bacteriophage based assay in the rapid diagnosis of pulmonary tuberculosis. *Phil J Microbiol Infect Dis.* **32(1)**: 1 – 10.
- Benadie Y., Deysel M., Siko D.G.R., Roberts V.V., Van Wyngaardt S., Thanyani S.T., Sekanka G., Ten Bokuma A.M.C., Collett L.A., Grooten J., Baird M.S., and Verschoor J.A. (2008). Cholesteroid nature of free mycolic acids from *M. tuberculosis*. *Chem Phys Lipids* **152**: 95 – 103.
- Bertucci C., and Cimitan S. (2003). Rapid screening of small ligand affinity to human serum albumin by an optical biosensor. *J Pharm Biomed Anal.* **32**: 707 – 714.
- Brindle, R.J., Nunn, P.P., Githui, W., Allen, B.M., and Waiyaki, P. (1993). Quantitative bacillary response to treatment in HIV-associated pulmonary tuberculosis. *Am Rev Respir Dis.* **147**: 958 – 961.

Buckingham S.J., Haddow L.J., Shaw P.J., and Miller R.F. (2004). Immune reconstitution inflammatory syndrome in HIV-infected patients with mycobacterial infections starting highly active anti-retroviral therapy. *Clin Radiol.* **59**: 505 – 513.

Buckle P.E., Davies R.J., Kinning T., Yeung D., Edwards P.R., and Pollard-Knight D. (1993). The resonant mirror: a novel optical sensor for direct sensing of biomolecular interactions Part II: Applications. *Biosens Bioelectron* **8**: 355 – 363.

Chaki N.K., and Vijayamohan K. (2002). Self-assembled monolayers as a tunable platform for biosensor applications. *Biosens Bioelectron.* **17**: 1 – 12.

Chan E.D., Laurel V., Strand M.J., Chan J.F., Huynh M.L., Goble M., and Iseman M.D. (2001). Treatment and outcome analysis of 205 patients with multidrug-resistant tuberculosis. *Am J Respir Crit Care Med.* **169(10)**: 1103 – 1109.

Chan E.D., Reves R., Belisje J.T., Brennan P.J., and Hahn W.E. (2000). Diagnosis of tuberculosis by a visually detectable immunoassay for lipoarabinomannan. *Am J Respir Crit Care Med.* **161**: 1713 – 1719.

Charnace G., and Delacourt C. (2001). Diagnostic techniques in paediatric tuberculosis. *Paediatr Respir Rev.* **2**: 120 – 125.

Chatterjee D. (1997). The mycobacterial cell wall: structure, biosynthesis and sites of drug action. *Curr Opin Chem Biol.* **1**: 579 – 588.

Chung J.W., Kim D.S., Bernhardt R., and Pyun J.C. (2005). Application of SPR biosensor for medical diagnostics of human hepatitis B virus (hHBV). *Sensor Actuator B* **111(112)**: 416 – 422.

Colebunders R., and Bastian I. (2000). A review of the diagnosis and treatment of smear-negative pulmonary tuberculosis. *Int J Tuberc Lung Dis.* **4**: 97 – 107.

Corbett E., Marston B., Churchyard G., and De Cock K.M. (2006). Tuberculosis in sub-Saharan African: opportunities, challenges, and change in the era of antiretroviral treatment. *Lancet* **367**: 926 – 937.

Cush R., Cronin J.M., Stewart W.J., Maule C.H., Molloy J., and Goddard N.J. (1993). The resonant mirror: a novel optical biosensor for direct sensing of biomolecular interactions Part I: Principle of operation and associated instrumentation. *Biosens Bioelectron.* **8**: 347 – 353.

Daniel T.M., and Debanne S.M. (1987). The serodiagnosis of tuberculosis and other mycobacterial diseases by enzyme-linked immunosorbent assay. *Am Rev Respir Dis.* **135(5)**: 1137 – 1151.

Daniel T.M., Sippola A.A., Okwera A., Kabengeru S., Hatanga E., Aisu T., Nyole S., Byekwaso F., Vjecha M., and Ferguson L.E. (1994). Reduced sensitivity of tuberculosis serodiagnosis in patients with AIDS in Uganda. *Tuberc Lung Dis.* **75(1)**: 33 – 38.

De Luna F.F., Gutierrez P.R.J., and Casal M. (2006). Evaluation of the GenoType Mycobacteria Direct Assay for Detection of *Mycobacterium tuberculosis* Complex and Four Atypical Mycobacterial Species in Clinical Samples. *J Clin Microbiol.* **44(8)**: 3025 – 3027.

Deysel M.S.D. (2008). Structure-function relationships of mycolic acids in tuberculosis. Ph.D. Thesis, Department of Biochemistry, Faculty of Natural and Agricultural Sciences, University of Pretoria.

Dijkstra J., Swartz G.M., Raney J.J., Aniagolu J., Toro L., Nacy C.A., and Green S.J. (1996). Interaction of anti-cholesterol antibodies with human lipoproteins. *J Immunol.* **157(5)**: 2006 – 2013.

Dobson G., Minnikin D.E., Minnikin S.M., Parlett J.H., Goodfellow M., Ridell M., Magnusson M. (1985). Systematic analysis of complex mycobacterial lipids. In: Goodfellow M., Minnikin D.E. (Eds.). *Chemical Methods of Bacterial Systematics*. Academic Press, London. pp. 237–265.

Doherty T.M., Demissie A., Olobo J., Wolday D., Britton S., Egualé T., Ravn P., and Anderson P. (2002). Immune response to the *Mycobacterium tuberculosis*-specific antigen ESAT-6 signal subclinical infection among contacts of tuberculosis patients. *J Clin Microbiol.* **40(2)**: 704 – 706.

Dostalek J., Vaisocherova H., and Homola J. (2005). Multichannel surface plasmon resonance biosensor with wavelength division multiplexing. *Sensors Actuators B* **108**: 758 – 764.

Doucet-Populaire F., Lalande V., Carpentier E., Bourgoin A., Dailloux M., Bollet C., Vachee A., Moinard D., Texier-Maugein J., Carbonnelle B., and Grosset J. (1996). A blind study of the polymerase chain reaction for the detection of *Mycobacterium tuberculosis* DNA. *Tuberc Lung Dis.* **77**: 358 – 362.

Drowart A., Huygen K., De bruyn J., Yernault J.C, Farber C.M., and Van Vooren J.P. (1991). Antibody levels to whole culture filtrate antigens and to purified P32 during treatment of smear-positive tuberculosis. *Chest* **100**: 685 – 687.

Dye C., Watt C.J., Bleed D.M., Hosseini S.M., and Raviglione M.C. (2005). Evolution of tuberculosis control and prospects for reducing tuberculosis incidence, prevalence, and deaths globally. *J Am Med Assoc.* **293(22)**: 2767 – 2775.

Eastoe J., and Ellis C. (2007). De-gassed water and surfactant-free emulsions: History, controversy, and possible applications. *Adv Coll Interf Sci.* **134(135)**: 89 – 95.

Ewer K., Deeks J., Alvarez L., Bryant G., Waller S., Andersen P., Monk P., and Lalvani A. (2003). Comparison of T-cell-based assay with tuberculin skin test for diagnosis of *Mycobacterium tuberculosis* infection in a school tuberculosis outbreak. *Lancet* **361**: 1168 – 1173.

Farris A.B., and Branda J.A. (2007). QuantiFERON-TB gold assay for tuberculosis infection. *Clin Microbiol Newslett.* **29(17)**: 129 – 136.

Fawley W., and Wilcox M.H. (2005). Molecular diagnostic techniques. *Diagn Infect.* **33(3)**: 26 – 32.

FIND (2007), Foundation for Innovative New Diagnostics newsletter. New diagnostics help fight tuberculosis. www.finddiagnostic.org, Geneva, Switzerland.

Foulds J., and O'Brien R. (1998). New tools for the diagnosis of tuberculosis: The perspective of developing countries. *Int J Tuberc Lung Dis.* **2(10)**: 778 – 783.

Frieden T.R., Sterling T.R., Munsiff S.S., Watt C.J., and Dye C. (2003). Tuberculosis. *Lancet* **362**: 887 – 899.

Frostell-Karlsson A., Remaeus A., Roos H., Andersson K., Borg P., Hamalainen M., and Karlsson R. (2000). Biosensor analysis of the interaction between immobilized human serum albumin and drug compounds for prediction of human serum albumin binding levels. *J Med Chem.* **43**: 1986 – 1992.

Frothingham R., Stout J.E., and Hamilton C.D. (2005). Current issues in global tuberculosis control. *Int J Infect Dis.* **9**: 297 – 311.

Fujita Y., Doi T., Sato K., and Jano I. (2005a). Diverse humoral response and changes in IgG antibody levels against mycobacterial lipid antigens in active tuberculosis. *Microbiology.* **151**: 2065 – 2074.

Fujita Y., Naka T., McNeil M.R., and Yano I. (2005b). Intact molecular characterization of cord factor (trehalose 6,6'-dimycolate) from nine species of mycobacteria by MALDI-TOF mass spectrometry. *Microbiology* **151**: 3403 – 3416.

Fujiwara N., Pan J., Enomoto K., Terano Y., Honda T., and Yano I. (1999). Production and partial characterization of anti-cord factor (trehalose-6,6'-dimycolate) IgG antibody in rabbits recognizing mycolic acid subclasses of *Mycobacteriosis* or *Mycobacterium avium*. *FEMS Immunol Med Microbiol.* **24**: 141 – 149.

GeneXpeert System, (2008) Cepheid, Improving health through on-demand molecular diagnostics. www.cepheid.com.

Goodrum M.A., Siko D.G.R., Niehues T., Eichelbauer D., and Verschoor J.A. (2001). Mycolic acids from *Mycobacterium tuberculosis*: purification by countercurrent distribution and T-cell stimulation. *Microbios* **106**: 55 – 67.

Grange J.M. (2001). *Mycobacterium bovis* infection in human beings. *Tuberculosis* **81(1/2)**: 71 – 77.

Guillerm M., Usdin M., and Arkininstall J. (2006). Tuberculosis diagnosis and drug sensitivity testing: An overview of the current diagnostic pipeline. *Medicins Sans Frontieres. Campaign Access Essential Medicines.* pp.1 – 35.
www.accessmed-msf.org.

Hain Lifescience GmbH (2007). GenoType MTBDRplus: www.hain-lifescience.de, Germany.

Hamasur R., Bruchfeld J., Haile M., Pawlowski A., Bjorvatn B., Kallenius G., and Svenson S.B. (2001). Rapid diagnosis of tuberculosis by detection of mycobacterial lipoarabinomannan in urine. *J Microbiol Methods* **45**: 41 – 52.

Han J., Wang X., and Kwok D. L. (2004). Structure and stability of self-assembled monolayer for octadecanethiol adsorbed on flame annealing gold substrate and its potential application to microfluidics. *ICMENS.* **4**: 1 – 4.

Harada N., Higuchi K., Yoshiyama T., Kawabe Y., Fujita A., Sasaki Y., Horiba M., Mitarai S., Yonemaru M., Ogata H., Ariga H., Kurashima A., Wada A., Takamori M., Yamagishi F., Suzuki K., Mori T., and Ishikawa N. (2008). Comparison of the sensitivity and specificity of two whole blood interferon-gamma assays for *M. tuberculosis* infection. *J Infect.* **56**: 348 – 353.

Hazbon M.H. (2004). Recent advances in molecular methods for early diagnosis of tuberculosis and drug-resistant tuberculosis. *Biomedica* **24(1)**: 149 – 162.

He F., and Zhang L., (2002). Rapid Diagnosis of *M. tuberculosis* using a piezoelectric immunosensor. *Anal Sci.* **18**: 397 – 401.

Hendrickson R.C., Douglass J.F., Reynold L.D., McNeill P.D., Carter D., Reed S.G., and Houghton R. (2000). Mass spectrometric identification of Mtb81, a novel serological marker for tuberculosis. *J Clin Microbiol.* **38(6)**: 2354 – 2361.

Higuchi K., Harada N., Fukazawa K., and Mori T. (2008). Relationship between whole-blood interferon-gamma responses and the risk of active tuberculosis. *Tuberculosis* **88**: 244 – 248.

Hoa X.D., Kirk A.G., and Tabrizian M. (2007). Towards integrated and sensitive surface plasmon resonance biosensors: A review of recent progress. *Biosens Bioelectron.* **23**: 151 – 160.

Hornum M., Mortensen K.L., Kamper A., and Andersen A.B. (2008). Limitations of the QuantiFERON®-TB Gold test in detecting *Mycobacterium tuberculosis* infection in immunocompromised patients. *Eur J Int Med.* **19**: 137 – 139.

Horvath A., and Biro A. (2003). Anti-cholesterol antibodies in human sera. *Autoimmunity Rev.* **2**: 272 – 277.

Horvath A., Fust G., Horvath I., Vallus G., Duba J., Harcos P., Prohaszka Z., Rajnavolgyi E., Janoskuti L., Kovacs M., Csaszar A., Romics L., and Karadi I. (2001). Anti-cholesterol antibodies (ACHA) in patients with different atherosclerotic vascular disease and healthy individuals. Characterization of human ACHA. *Atherosclerosis* **156**: 185 – 195.

Huggett F.J, McHugh T.D, and Zumla A. (2003). Tuberculosis: amplification-based clinical diagnostic techniques. *Int J Biochem Cell Biol.* **35**: 1407 – 1412.

Hunter S.W., Gaylord H., and Brennan P.J. (1986). Structure and antigenicity of the phosphorylated lipopolysaccharide antigens from the leprosy and tubercle bacilli. *J Biol Chem.* **261(26)**: 12345 – 12361.

Jongorius-Gortemaker B.G.M., Goverde R.L.J, Knapen F., and Bergwerff A.A. (2002). Surface plasmon resonance (BIACORE) detection of serum antibodies against *Salmonella enteritidis* and *Salmonella typhimurium*. *J Immunol Methods* **266**: 33 – 44.

Julian E., Cama M., Martinez P., and Luquin M. (2001). An ELISA for five glycolipids from the cell wall of *Mycobacterium tuberculosis*: Tween 20 interference in the assay. *J Immunol Methods* **251**: 21 – 30.

Julian E., Matas L., Ausina V., and Luquin M. (1997). Detection of lipoarabinomannan antibodies in patients with newly acquired tuberculosis and patients with relapse tuberculosis. *J Clin Microbiol.* **35(10)**: 2663 – 2664.

Julian E., Matas L., Perez A., Alcaide J., Laneelle M., and Luquin M. (2002). Serodiagnosis of Tuberculosis: Comparison of Immunoglobulin A (IgA) Response to Sulfolipid I with IgG and IgM Responses to 2,3- Diacyltrehalose, 2,3,6-Triacyltrehalose, and Cord Factor Antigens. *J Clin Microbiol.* **40(10)**: 3782 – 3788.

Kanchana M.V., Cheke D., Natyshak I., Connor B., Warner A., and Martin T. (2000). Evaluation of the BACTECTTM MGITTM 960 system for the recovery of mycobacteria. *Diagn Microbiol Infect Dis.* **37**: 31 – 36.

Khasnabis S., Escuyar V.E., and Chatterjee D. (2002). Emerging therapeutic targets in tuberculosis: post-genomic era. *Expert Opin Ther Targets* **6(1)**: 21 – 40.

Kim H. D., Noh J.; Hara M., and Lee H. (2001). An adsorption process study on the self-assembled monolayer formation of octadecanethiol chemisorbed on gold surface. *Bull Korean Chem Soc.* **22(3)**: 276 – 280.

Kim S.J., Gobi K.V., Iwasaka H., Tanaka H., and Miura N. (2007). Novel miniature SPR immunosensor equipped with all-in-one-microchannel sensor chip for detecting low-molecular weight analytes. *Biosens Bioelectron.* **23**: 701 – 707.

Koza G., and Baird M.S. (2007). The first synthesis of single enantiomers of ketomycolic acids. *Tetrahedron Lett.* **48**: 2165 – 2169.

Kulshrestha A., Gupta A., Verma N., Sharma S.K., Tyagi A.K., and Chaudhary V.K. (2005). Expression and purification of recombinant antigens of *Mycobacterium tuberculosis* for application in serodiagnosis. *Prot Expr Purif.* **44**: 75 – 85.

Kunst H. (2006). Diagnosis of latent tuberculosis infection: The potential role of new technologies. *Res Med.* **100(12)**: 2098 – 2106.

Lambert M., Hasker E., Van Deun A., Roberfroid D., Boelaert M., and Van der Stuyft P. (2003). Recurrence in tuberculosis: relapse or reinfection. *Lancet Infect Dis.* **3**: 282 – 287.

Laverdiere M., Poirier L., Weiss K., Beliveau C., Bedard L., and Desnoyers D. (2000). Comparative evaluation of the MB/BacT and BACTEC 460 TB systems for the detection of mycobacteria from clinical specimens: clinical relevance of higher recovery rates from broth-based detection systems. *Diagn Microbiol Infect Dis.* **36**: 1 – 5.

Lawn S.D., Bekker L., and Miller R.F. (2005). Immune reconstitution disease associated with mycobacterial infections in HIV-infected individuals receiving antiretrovirals. *Lancet* **5**: 361 – 373.

Lawn S.D., Frimpong E.H., and Nyarko E. (1997). Evaluation of a commercial immunodiagnostic kit incorporating lipoarabinomannan in the serodiagnosis of pulmonary tuberculosis in Ghana. *Trop Med Int Health* **2(10)**: 978 – 981.

Lazcka O., Campo F.J.D., and Munoz F.X. (2007). Pathogen detection: A perspective of traditional methods and biosensors. *Biosens Bioelectron.* **22**: 1205 – 1217.

Leatherbarrow R.J., and Edwards P.R. (1999). Analysis of molecular recognition using optical biosensors. *Curr Opin Chem Biol.* **3**: 544 – 547.

Lee W.J., Sim J.S, Cho M.S., and Lee J. (2005). Characterization of self-assembled monolayer of thiol on a gold surface and the fabrication of a biosensor chip based on surface plasmon resonance for detecting anti-GAD antibody. *Biosens Bioelectron.* **20**: 1422 – 1427.

Leonard P., Hearty S., Brennam J., Dunne L., and Quinn J. (2002). Advances in biosensors for detection of pathogens in food and water. *Enzyme Microb Technol.* **6185**: 3 – 13.

Levis W.R., Meeker H.C., Schuller-Levis G., Sersen E., Brennan P.J., and Fried P. (1987). Mycobacterial carbohydrate antigens for serological testing of patients with leprosy. *J Infect Dis.* **156(5)**: 793 – 769.

Lopez-Marin L.M., Segura E., Hermida-Escobedo C., Lemassu A., and Salinas-Carmona M.C. (2003). 6,6'-Dimycoloyl trehalose from a rapidly growing *Mycobacterium*: an alternative antigen for tuberculosis serodiagnosis. *FEMS Immunol Med Microbiol.* **36**: 47 – 54.

Luppa P.B., Sokoll L.J, and Chan D.W. (2001). Immunosensors—principles and applications to clinical chemistry. *Clin Chim Acta* **314**: 1 – 26.

Lyashchenko K.P., Colangeli R., Houde M., Jahdali H., Menzies D., and Gennaro M.L. (1998). Heterogeneous antibody responses in tuberculosis. *Infect Immunol.* **66(8)**: 3936 – 3940.

Maekura R., Okuda Y., Nakagawa M., Hiraga T., Yokota S., Ito M., Ikuya Yano I., Kohno H., Wada M., Abe C., Toyoda T., Kishimoto T., and Ogura T. (2001). Clinical Evaluation of anti-tuberculous glycolipid immunoglobulin-G antibody assay for rapid serodiagnosis of pulmonary tuberculosis. *J Clin Microbiol.* **39(10)**: 3603 – 3608.

Maekura R., Nakagawa M., Nakamura Y., Hiraga T., Yamamura Y., Ito M., Ueda E., Yano S., He H., and Oka S. (1993). Clinical evaluation of rapid serodiagnosis of pulmonary tuberculosis by ELISA with cord factor (trehalose-6,6'-dimycolate) as antigen purified from *Mycobacterium tuberculosis*. *Am Rev Respir Dis.* **148**: 997 – 1001.

Malmqvist M. (1999). Biacore: an affinity biosensor system for characterization of biomolecular interactions. *Biosensors* **27**: 335 – 340.

Malmqvist M., and Karlsson R. (1997). Biomelecular interaction analysis: affinity biosensor technologies for functional analysis of proteins. *Curr Opin Chem Biol.* **1**: 378 – 383.

Manosuthi W., Kiertiburanakul S., Phoorisri T., and Sungkanuparph S. (2006). Immune reconstitution inflammatory syndrome of tuberculosis among HIV-infected patients receiving antituberculosis and antiretroviral therapy. *J Infect.* **53**: 357 – 363.

Marcheini G.R., Koopal K., Meulenberg E., Haasnoot W., and Irth H. (2007). Spreeta-based biosensor assays for endocrine disruptors. *Biosens Bioelectron.* **22**: 1908 – 1915.

Margot B. (2008a). Tuberculosis drug-resistance in KwaZulu-Natal. 1st TB conference, ICC Durban, South Africa.

Margot B. (2008b). XDR TB has re-awakened focus on TB. Health-e: South African health news service. <http://www.health-e.org.za/news>.

Markgren P., Hamalainen M., and Danielson U.H. (2000). Kinetic analysis of the interaction between HIV-1 protease and inhibitors using biosensor technology. *Anal Biochem.* **279**: 71 – 78.

Matsushita T., Nishikawa T., Yamashita H., Kishimoto J., and Okuno Y. (2008). Development of new single-mode waveguide surface plasmon resonance sensor using a polymer imprint process for high-throughput fabrication and improved design flexibility. *Sensors Actuators B* **129**: 881 – 887.

McConkey S.J., Youssef F.G., Azem E., Frenck R.W., and Weil G.J. (2002). Evaluation of a rapid-format antibody test and the tuberculin skin test for diagnosis of tuberculosis in two contrasting endemic settings. *Int J Tuberc Lung Dis.* **6(3)**: 246 – 252.

McNerney R., Wilson S.M., Sidhu A.M., Harley V.S., Suwaidi Z., Nye P.M., Parish T., and Stoker N.G. (1998). Inactivation of mycobacteriophage D29 using ferrous ammonium sulphate as a tool for the detection of viable *Mycobacterium smegmatis* and *M. tuberculosis*. *Res Microbiol.* **149**: 487 – 495.

Mitarai S., Tanoue S., Surita C., Sugihara E., Tamura A., Nagono Y., Tsuboi M., Nagayama N., Kurashima A., Nagai H., and Shishido H. (2001). Potential use of amplicor PCR kit in diagnosing pulmonary tuberculosis from gastric aspirate. *J Microbial Methods* **47**: 339 – 344.

Miura N., Sasaki M., Gobi K.V., Kataoka C., and Shoyama Y. (2003). Highly sensitive and selective surface plasmon resonance sensor for detection of sub-ppb levels of benzo[a]pyrene by indirect competitive immunoreaction method. *Biosens Bioelectron.* **18**: 953 – 959.

Moody D.B., Reinhold B.B., Guy M.R., Beckman E.M., Frederique D.E., Furlong S.T., Ye S., Reinhold V.N., Sieling P.A., Modlin R.L., Besra G.S., and Porcelli S.A. (1997). Structural requirements for glycolipid antigen recognition by CD1b-restricted T cells. *Science* **278(5336)**: 283 – 286.

Moody D.B., Reinhold B.B., Reinhold V.N., Besra G.S., and Porcelli S.A. (1999). Uptake and processing of glycosylated mycolates for presentation to CD1b-restricted T cells. *Immunol Lett.* **65**: 85 – 91.

Moran A.J., Treit J.D., Whitney J.L., Abomoelak B., Houghton R., Skeiky Y.A.W., Sampaio D.P., Badaro R., and Nano F.E. (2001). Assessment of the serodiagnostic potential of nine novel proteins from *Mycobacterium tuberculosis*. *FEMS Microbiol Lett.* **198**: 31 – 36.

Morgan L.C., Newman D.J., Cohen S.B.A., Lowe P., and Price C.P. (1998). Real-time analysis of cell surface HLA class I interactions. *Biosens Bioelectron.* **13**: 1099 – 1105.

Morgan M.A., Horstmeier C.D., Deyoung D.R., and Roberts G.D. (1983). Comparison of a radiometric method (BACTEC) and conventional culture media for recovery of mycobacteria from smear-negative specimens. *J Clin Microbiol.* **18(2)**: 384 – 388.

Morrison J., Pai M., and Hopewell P. (2008). Tuberculosis and latent tuberculosis infection in close contacts of people with pulmonary tuberculosis in low-income and middle-income countries: a systematic review and meta-analysis. *Lancet* **1016**: 1 – 9.

Muller K.M., Arndt K.M., and Pluckthun A. (1998). Model and simulation of multivalent binding to fixed ligands. *Anal Biochem.* **261**: 149 – 158.

Mwandumba H.C., Squire S.B., White S.A., Nyirenda M.H., Kampondeni S.D., Rhoades E.R., Zijlstra E.E., and Molyneux M.E. (2008). Association between sputum smear status and local immune responses at the site of disease in HIV-infected patients with pulmonary tuberculosis. *Tuberculosis* **88(1)**: 58 – 63.

Myszka D.G. (1999). Survey of the 1998 optical biosensor literature. *J Mol Recognit.* **12**: 390 – 408.

Nagel T., Ehrentreich-Forster E., Singh M., Schmitt K., Brandenburg A., Berka A., and Bier F. (2007). Direct detection of tuberculosis infection in blood serum using three optical label-free approaches. *Sensors Actuators B* **129**: 934 – 940.

Pai M., Kalantri S., and Dheda K. (2006). New tools and emerging technologies for the diagnosis of tuberculosis: Part II. Active tuberculosis and drug resistance. *Expert Rev Mol Diagn.* **6(3)**: 413 – 422.

Pai M., Kalantri S., Pascopella L., Riley L.W., and Reingold A.L. (2005). Bacteriophage-based assays for the rapid detection of rifampicin resistance in *Mycobacterium tuberculosis*: a meta-analysis. *J Infect.* **51**: 175 – 187.

Pai M., Riley L.W., and Colford Jr J.M. (2004). Interferon- γ assays in the immunodiagnosis of tuberculosis: a systematic review. *Lancet Infect Dis.* **4**: 761 – 776.

Palma-Nicolása J.P., and Bocanegra-García V. (2007). Innovative strategies to diagnose and monitor tuberculosis patients. *Arch Bronco Neumol.* **43(4)**: 225 – 332.

Palomino J.C., Leao S.C., and Ritacco V. (2007). Tuberculosis 2007: From basic science to patient care. First edition. Pedro Cardoso Leao, Brazil. pp 401 – 483. www.tuberculosisistextbook.com.

- Pan J., Fujiwara N., Oka S., Maekura R., Ogura T., and Yano I. (1999). Anti-Cord Factor (Trehalose 6,6'-Dimycolate) IgG antibody in tuberculosis patients recognizes mycolic acid subclasses. *Microbiol Immunol.* **43(9)**: 863 – 869.
- Pashley, R.M. (2005). Process for the production of emulsions and dispersions. US patent application 2005/0096398.
- Patil S.A., Ramu G, and Patil M. (1995). Lipoarabinomannan antigen and anti-lipoarabinomannan antibody profile in the serum of patients with mycobacterial infections and their significance in disease process. *Serodiagn Immunother Infect Dis.***7**: 59 – 63.
- Pejic B., De Marco R., and Parkinson G. (2006). The role of biosensors in the detection of emerging infectious diseases. *Analyst* **131**: 1079 – 1090.
- Perkins M.D., and Kritski A.L. (2002). Diagnostic testing in the control of tuberculosis. *Bulletin WHO* **80(6)**: 512 – 513.
- Perkins M.D., Roscigno G., and Zuma A. (2006). Progress towards improved tuberculosis diagnostics for developing countries. *Lancet* **367**: 942 – 943.
- Piersimoni C., and Scarparo C. (2008). Pulmonary infections associated with non-tuberculous mycobacteria in immunocompetent patients. *Lancet Infect Dis.* **8**: 323 – 334.
- Porcelli S.A., Morita C.T., and Modlin R.L. (1996). T-cell recognition of non-peptide antigens. *Curr Opin Immunol.* **8**: 510 – 516.
- Pottunarthi S., Wells V.C., and Morris A.J. (2000). A Comparison of seven tests for serological diagnosis of tuberculosis. *J Clin Microbiol.* **38(6)**: 2227 – 2231.
- Price P., Mathiot N., Krueger R., Stone S., Keane N.M., and French M.A. (2001). Immune dysfunction and immune restoration disease in HIV patients given highly active antiretroviral therapy. *J Clin Vir.* **22**: 279 – 287.

- Radler U., Mack J., Persike N., Jung G., and Tampe R. (2000). Design of supported membranes tethered via metal-affinity ligand-receptor pairs. *Biophys J.* **79**: 3144 – 3152.
- Raja A., Ranganathan U.D., and Bethunaickan R. (2008). Improved diagnosis of pulmonary tuberculosis by detection of antibodies against multiple *Mycobacterium tuberculosis* antigens. *Diagn Microbiol Infect Dis.* **60**: 361 – 368.
- Raqib R., Rahman J., Kamaluddin A.K.M., Kamel S.M.M., Banu F.A., Ahmed S., Rahim Z., Bardhan P.K. Anderson J., and Sack D.A. (2003). Rapid diagnosis of active tuberculosis by detecting antibodies from lymphocyte secretions. *J Infect Dis.* **188**: 364 – 370.
- Ratanasuwan W., Kreiss J.K., Nolah C.M., Schaeffler B.A., Suwanagool S., Tunsupasawadikul S., Chuchottaworn C. Dejsomritrutai W., and Foy H.M. (1997). Evaluation of the MycoDot test for the diagnosis of tuberculosis in HIV seropositive and seronegative patients. *Int J Tuberc Lung Dis.* **1(3)**: 259 – 264.
- Reischl U. (1996). Application of molecular biology-based methods to the diagnosis of infectious diseases. *Front Biosci.* **1**: 72 – 77.
- Riley L.W. (2006). Of mice, men, and elephants: *Mycobacterium tuberculosis* cell envelope lipids and pathogenesis. *J Clin Invest.* **116(6)**: 1475 – 1478.
- Rodriguez-Mozaz S., Marco M.P., de Alda M.J.L., and Barcelo D. (2004). Biosensors for environmental applications: Future development trends. *Pure Applied Chem.* **76(4)**: 723 – 752.
- Rogers K.R. (2000). Principles of affinity-based biosensors. *Mol Biotechnol.* **14**: 109 – 129.

Ruhwald M., Bjerregaard-Anderson M., Rabna P., kofoed k., Eugen-Olsen J., and Ravn P. (2007). CXCL10/IP-10 release is induced by incubation of whole blood from tuberculosis patients with ESAT-6, CFP10 and TB7.7. *Microbes Infect.* **9**: 806 – 812.

Sada E., Brennan P.J., Herrera T., and Torres M. (1990). Evaluation of lipoarabinomannan for the serological diagnosis of tuberculosis. *J Clin Microbiol.* **28(12)**: 2587 – 2590.

Samanich K.M., Keen M.A., Vissa V.D., Harder J.D., Spencer J.S., Belisle J.T., Zolla-Pazner S., and Laal S. (2000). Serodiagnostic potential of culture filtrate antigens of *Mycobacterium tuberculosis*. *Clin Diagn Lab Immunol.* **7(4)**: 662 – 668.

Sao T., Juang T.C.Y., Sai T., Lan Y.C., and Lee C.H. (1992). Whole lung tuberculosis – a disease with high mortality which is frequently misdiagnosed. *Chest* **101**:1309 – 1311.

Scarparo C., Piccoli P., Rigon A., Ruggiero G., Ricordi P., and Piersimoni C. (2002). Evaluation of the BACTEC MGIT 960 in comparison with BACTEC 460 TB for detection and recovery of mycobacteria from clinical specimens. *Diagn Microbiol Infect Dis.* **44**: 157 – 161.

Scarparo C., Piccoli P., Rigon A., Ruggiero G., Scagnelli M. and Piersimoni, C. (2000). Comparison of enhanced *Mycobacterium tuberculosis* Amplified Direct Test with COBAS AMPLICOR *Mycobacterium tuberculosis* assay for direct detection of *Mycobacterium tuberculosis* complex in respiratory and extrapulmonary specimens. *J Clin Microbiol.* **38**: 1559 – 1562.

Scheller F.W., Wollenberger U., Warsinkel A., and Lisdat F. (2001). Research and development in biosensors. *Curr Opin Biotechnol.* **12**: 35 – 40.

Schleicher G.K., Feldman C., Vermaak Y., and Verschoor J.A. (2002). Prevalence of anti-mycolic acid antibodies in patients with pulmonary tuberculosis co-infected with HIV. *Clin Chem Lab Med.* **40(9)**: 882 – 887.

Schuck P. (1996). Kinetics of ligand binding to receptor immobilized in a polymer matrix, as detected with an evanescent wave biosensor. I. A computer simulation of the influence of mass transport. *J Biophys.* **70**: 1230 – 1249.

Shankar P., Manjunath N., Lakshmi R., Aditi B., and Seth P. (1990). Identification of *Mycobacterium tuberculosis* by PCR. *Lancet* **335**: 423 – 427.

Shankaran D.R., Gobi K.V., and Miura N. (2007). Recent advancements in surface plasmon resonance immunosensors for detection of small molecules of biomedical, food and environmental interest. *Sensors Actuators B* **121**: 158 – 177.

Shibuya Y., Shiozaki T., Hayashi M., and Sugiyama Y. (2000). Efficacy of amplicor PCR for the diagnosis of tuberculosis in respiratory specimens other than sputum. *Tuberc Lung Dis.* **80(4/5)**: 209 – 215.

Siddiqi K., Lambert M., and Walley J. (2003). Clinical diagnosis of smear-negative pulmonary tuberculosis in low-income countries: the current evidence. *Lancet Infect Dis.* **3**: 288 – 296.

Siko D.G.R. (2002). Mycobacterial mycolic acids as immunoregulatory lipid antigens in the resistance to tuberculosis. Ph.D. Thesis, Department of Biochemistry, Faculty of Natural and Agricultural Sciences, University of Pretoria.

Simonney N., Bourrillon A., and Lagrange P.H. (2000). Analysis of circulating immune complexes (CICs) in childhood tuberculosis: levels of specific antibodies to glycolipid antigens and relationship with serum antibodies. *Int J Tuberc Lung Dis.* **4(2)**: 152 – 160.

Simonney N., Chavanet P., Perronne C., Leportier M., Revol F., Herrmann J., and Lagrange P.H. (2007). B-cell immune responses in HIV positive and HIV negative patients with tuberculosis evaluated with an ELISA using a glycolipid antigen. *Tuberculosis* **87**: 109 – 122.

- Simonney N., Labrousse H., Ternyck T., and Lagrange P.H. (1996). Recycling of ELISA plate for the serological diagnosis of tuberculosis using a *Mycobacterium tuberculosis*-specific glycolipid antigen. *J Immunol Methods* **199**: 101 – 105.
- Sonnenberg P., Murray J., Glynn J.R., Shearer S., Kambashi B., and Godfrey-Faussett P. (2001). HIV-1 and recurrence, relapse, and reinfection of tuberculosis after cure: a cohort study in South Africa mineworkers. *Lancet* **358**: 1687 – 1693.
- Sousa A.O., Wargnier A., Poinsignon Y., Simonney N., Gerber F., Lavergne F., Herrmann J.L., and Langrange P.H. (2000). Kinetics of circulating antibodies, immune complex and specific antibody-secreting cells in tuberculosis patients during 6 months of antimicrobial therapy. *Tuberc Lung Dis.* **80(1)**: 27 – 33.
- Starvi H., Moldovan O., Mihaltan F., Banica D., and Doyle R.J. (2003). Rapid dot sputum and serum assay in pulmonary tuberculosis. *J Microbiol Methods* **52**: 285 – 296.
- Steingart K.R., Henry M., Laal S., Hopewell P.C., Ramsay A., Menzies D., Cunningham j., Weldingh K., and Pai M. (2007). Commercial serological antibody detection tests for the diagnosis of pulmonary tuberculosis: A systematic review. *PLOS Med.* **4(6)**: 1 – 20.
- Sun Y., Bai Y., Song D., Li X., Wang L., and Zhang H. (2007). Design and performances of immunoassay based on SPR biosensor with magnetic microbeads. *Biosens Bioelectron.* **23**: 473 – 478.
- Taci N., Yurdakul A.S., Ceyhan I., Berktaş M.B., and Ogretensoy M. (2003). Detection of *Mycobacterium tuberculosis* DNA from peripheral blood in patients with HIV-seronegative and new cases of smear-positive pulmonary tuberculosis by polymerase chain reaction. *Res Med.* **97**: 676 – 681.
- Tecilla P., Dixon P.D., Slobodkin G., Alavi D.S., Waldeck D.H., and Hamilton A.H. (1990). Hydrogen-Bonding Self- Assembly of Multichromophore Structures. *J Am Chem Soc.* **112**: 9408 – 9410.

- Tessema T.A., Bjune G., Assefa G., Svenson S., Hamasur B., and Bjorvatn B. (2002). Clinical and Radiological Features in Relation to Urinary Excretion of Lipoarabinomannan in Ethiopian Tuberculosis Patients. *J Infect Dis.* **34(3)**: 167 – 171.
- Tiwari R.P., Hattikudur N.S., Bharmal R.N., Kartikeyan S., Deshmukh N.M., and Bisen P.S. (2007). Modern approaches to a rapid diagnosis of tuberculosis: Promises and challenges ahead. *Tuberculosis* **87**: 193 – 201.
- Thanyani T.S. (2003). A novel application of affinity biosensor technology to detect antibodies to mycolic acid in tuberculosis patients. M.Sc. Thesis, Department of Biochemistry, Faculty of Natural and Agricultural Sciences, University of Pretoria.
- Toossi Z., Mayanja-Kizza H., Hirsch C.S., Edmonds K.L., Spahlinger T., Hom D. L., Aung H., Munyenyei P., Ellner J.J., and Whaken C.W. (2001). Impact of tuberculosis (TB) on HIV-1 activity in dually infected patients. *Clin Exp Immunol.* **123**: 233 – 238.
- Trinker M., Hofler G., and Sill H. (1996). False-positive diagnosis of tuberculosis with PCR. *Lancet* **348**: 1388 – 1394.
- Tufariello J.M., Chan J., and Flynn J.L. (2003). Latent tuberculosis: mechanisms of host and bacillus that contribute to persistent infection. *Lancet Infect Dis.* **3**: 578 – 590.
- Uma Devi K.R., Ramalingam B., and Raja A. (2003). Antibody response to *Mycobacterium tuberculosis* 30 and 16kDa antigens in pulmonary tuberculosis with human immunodeficiency virus coinfection. *Diagn Microbiol Infect Dis.* **46(3)**: 205 – 209.
- Uma Devi K.R., Ramalingam B., Brennan P.J., Narayanan P.R., and Raja A. (2001). Specific and early detection of IgG, IgA and IgM antibodies to *Mycobacterium tuberculosis* 38 kDa antigen in pulmonary tuberculosis. *Tuberculosis* **81(3)**: 249 – 253.

Vadrot C., Bex V., Mouilleseaux A., Squinazi F., and darbord J.C. (2004). Detection of *Mycobacterium tuberculosis* complex by PCR in hospital air samples. *J Hosp Infect.* **58**: 262 – 267.

Valadas E., and Antunes F. (2005). Tuberculosis, a re-emergent disease. *Eur J Radiol.* **55**: 154 – 157.

Van Regenmortel M.H. (1999). Analysis of structure-activity relationships with biosensors. *Biosensors* **27**: 329 – 331.

Veenstra H., Baumann R., Luke P.T., Beyers N., van Helden P.D., and Walzl G. (2007). High levels of intracellular IL-4 are expressed in circulating apoptotic T cells in patients with tuberculosis and in community controls. *Clin Immunol.* **124**: 336 – 344.

Verma R.K., and Jain A. (2007). Antibodies to mycobacterial antigens for diagnosis of tuberculosis. *FEMS Immunol Med Microbiol* **51**: 453 – 461.

Vermaak Y. (2004). Properties of anti-mycolic acid antibodies in human tuberculosis patients. M.Sc. Thesis, Department of Biochemistry, Faculty of Natural and Agricultural Sciences, University of Pretoria.

Verschoor J.A., Lenaerts A., and Johannsen E. (1998). A composition comprising a carrier and a purified mycobacterial lipid cell-wall component and its use in the prevention, treatment and diagnosis of disease. International patent application no. PCT/GB 98/00681.

Verschoor J.A., and Onyebujoh P. (1999). The menace of the AIDS-tuberculosis combo: any solutions? *Bioessays* **21(5)**: 365 – 366.

Verschoor J.A., Siko D.G.R., and Van Wyngaardt S. (2005). A serodiagnostic method to detect antibodies to mycolic acid in tuberculosis patients as surrogate markers for infection. International patent application no. PCT/IB2005/051548 (11 May).

Wallis R.S., Perkins M., Phillips M., Joloba m., Demchuk B., Namale A., Johnson J.L., Williams d., Wolski K., Teixeira L., Dietze R., mugerwa R.D., Eisenach K., and Ellner J. (1998). Induction of the antigen 85 complex of Mycobacterium tuberculosis in sputum: A determinant of outcome in pulmonary tuberculosis treatment. *J infect Dis.* **178**: 1115 – 1121.

WHO (1997). WHO Tuberculosis Diagnostics Workshop: product development guidelines. pp. 1 – 27. WHO website. www.who.int/tdr/publications.

WHO (2001). Modelling the impact of new diagnostic technologies in disease endemic countries. TBDI Activity Summary, 1–5.

WHO (2006). WHO Report 2006 on Global TB Control (WHO/HTM/TB/2006.362).

WHO (2008). WHO report on Global TB control: surveillance, planning and financing (WHO/HTM/TB/2008.393)

Wilkinson R.J., Haslov K., Rappuoli R., Giovannoni F., Narayanan P.R., Desai C.R., Vordermeier H.M., Paulsen J., Pasvol G., Ivanyi J., and Singh M. (1997). Evaluation of the recombinant 38-kilodalton antigen of Mycobacterium tuberculosis as a potential immunodiagnostic reagent. *J Clin Microbiol.* **35(3)**: 553 – 557.

Wong Y.Y., Ng S.P., Ng M.H., Si S.H., Yao S.Z., and Fung Y.S. (2002). Immunosensor for the differentiation and detection of Salmonella species based on a quartz crystal microbalance. *Biosens Bioelectron.* **17**: 676 – 684.

Yuan Y., Zhu Y., Crame D.D.K., and Barry III C.E. (1998). The effect of oxygenated mycolic acid composition on cell wall function and macrophage growth in *Mycobacterium tuberculosis*. *Mol Microbiol.* **29(6)**: 1449 – 1428.

Zaki M.E., and Goda T. (2007). Rapid phenotypic assay of antimycobacterial susceptibility pattern by direct mycobacterial growth indicator tube and phage amplified biological assay compared to BACTEC 460 TB. *Tuberculosis* **87**: 102 – 108.

Zhang S., Wright G., and Yang Y. (2000). Materials and techniques for electrochemical biosensor design and construction. *Biosens Bioelectron.* **15**: 273 – 282.

Zhang Y., Wang H., Yan B., Zhang Y., Li J., Shen G., and Yu R. (2008). A reusable piezoelectric immunosensor using antibody-adsorbed magnetic nanocomposite. *J Immunol Methods* **332**: 103 – 111.