

## REFERENCES

- Abeyrathne PD, Lalev AI, Nazar RN. A RAC protein binding site in the internal transcribed spacer 2 of pre-rRNA transcripts from *Schizosaccharomyces pombe*. J Biol Chem. 2002;Manuscript M201751200.
- Adlard RD, Barker SC, Blair D, Cribbs TR. Comparison of the second internal transcribed spacer (ribosomal DNA) from populations and species of *Fasciolidae* (Digenea). Mol Biochem Parasitol. 1993;23:423-425.
- Almeyda-Artigas RJ, Bargues MD, Mas-Coma S. ITS-2 rDNA sequencing of Gnathostoma species (Nematoda) and elucidation of the species causing human gnathostomiasis in the Americas. J Parasitol 2000;86(3):537-544.
- Beaver PC, Brenes R, Salano GV. Zoonotic filaria in a subcutaneous artery of child in Costa Rica. Am J Trop Med Hyg. 1984;33:583-585.
- Behbehani K. Candidate parasitic disease. Bull World Health Organ. 1998;76:64-67.
- Cameron ML, Levy P, Nutman T, Vanamala CR, Narayanan PR, Rajan TV. Use of restriction fragment length polymorphisms (RFLPs) to distinguish between nematodes of pathogenic significance. Parasitology. 1988;96 ( Pt 2):381-390.
- Campbell AJ, Gasser RB, Chilton NB. Differences in a ribosomal DNA sequence of *Strongylus* species allows identification of single eggs. Int J Parasitol. 1995;25 (3):359-365.
- Chalifoux L, Hunt RD. Histochemical differentiation of *Dirofilaria immitis* and *Dipetalonema reconditum*. J Am Vet Med Assoc. 1971;158:601-605.
- Chambon P. Eukaryotic nuclear RNA polymerases. Annu Rev Biochem. 1975;44:613-638.
- Chanteau S, Glaziou P, Luquiaud P, Plichart C, Moulia-Pelat JP, Cartel JL. Og4C3 circulating antigen, anti-*Brugia malayi* IgG and IgG4 titers in *Wuchereria bancrofti* infected patients, according to their parasitological status. Trop Med Parasitol. 1994;45(3):255-257.
- Chungpivat S, Nithiuthai N, Sichanasai B, Santiwatanatarm T. Histochemical diagnosis of *Dirofilaria immitis* microfilariae by acid phosphatase activity. J Thai Vet Pract. 1990;2(3):195-203.
- Chungpivat S, Sucharit S. Microfilariae in cats in Bangkok. Thai J Vet Med. 1993;23 (2):75-87.

- Conole JC, Chilton NB, Jarvis T, Gasser RB. Mutation scanning analysis of microsatellite variability in the second internal transcribed spacer (precursor ribosomal RNA) for three species of *Metastrongylus* (Strongylida: Metastrongyloidea). *Parasitology*. 2001;122(Pt 2):195-206.
- Dissanayake S, Watawana L, Piessens WF. Lymphatic pathology in *Wuchereria bancrofti* microfilaraemic infections. *Trans R Soc Trop Med Hyg*. 1995;89:517-521.
- Dreyer G, Ottesen EA, Galdino E, Andrede L, Rocha A, Medeiros Z, Moura I, Casimiro I, Beliz F, Coutinho A. Renal abnormalities in microfilaremic patients with bancroftian filariasis. *Am J Trop Med Hyg*. 1992;46 (6):745-751.
- Dreyer G, Santos A, Noroes J, Rocha A, Addiss D. Amicrofilaraemic carriers of adult *Wuchereria bancrofti*. *Trans R Soc Trop Med Hyg*. 1996;90:288-289.
- Elder JF, Turner BJ. Concerted evolution of repetitive DNA sequences in eukaryotes. *Q Rev Biol*. 1995;70(3):297-320.
- Filariasis Division. Annual Report, Filariasis Division, CDC Department, Ministry of Public Health, Bangkok, Thailand. 1998. (in Thai)
- Filariasis Division. Annual Report, Filariasis Division, CDC Department, Ministry of Public Health, Bangkok, Thailand. 1999. (in Thai)
- Freedman DO, de Almeida Filho PJ, Besh S, Maia e Silva MC, Braga C, Maciel A. Lymphoscintigraphic analysis of lymphatic abnormalities in symptomatic and asymptomatic human filariasis. *J Infect Dis*. 1994;170(4):927-933.
- Gasser RB, Chilton NB, Hoste H, Stevenson LA. Species identification of trichostrongyle nematodes by PCR-linked RFLP. *Int J Parasitol*. 1994;24 (2):291-293.
- Gasser RB, Chilton NB. Characterisation of taeniid cestode species by PCR-RFLP of ITS2 ribosomal DNA. *Acta Trop*. 1995;59:31-40.
- Gasser RB, LeGoff L, Petit G, Bain O. Rapid delineation of closely-related filarial parasites using genetic markers in spacer rDNA. *Acta Trop*. 1996;62(3):143-150.
- Gasser RB. Mutation scanning methods for the analysis of parasite genes. *Int J Parasitol*. 1997;27(12):1449-1463.

- Gasser RB, Monti JR, Bao-Zhen Q, Polderman AM, Nansen P, Chilton NB. A mutation scanning approach for the identification of hookworm species and analysis of population variation. Mol Biochem Parasitol. 1998;92(2):303-312.
- Gasser RB, Zhu XQ. Sequence-based analysis of enzymatically amplified DNA fragments by mutation detection techniques. Parasitol Today. 1999;15 (11):462-465.
- Heise M, Epe C, Schnieder T. Differences in the second internal transcribed spacer (ITS-2) of eight species of gastrointestinal nematodes of ruminants. J Parasitol. 1999;85(3):431-435.
- Hoste H, Gasser RB, Chilton NB, Mallet S, Beveridge I. Lack of intraspecific variation in the second internal transcribed spacer (ITS-2) of *Trichostrongylus colubriformis* ribosomal DNA. Int J Parasitol. 1993;23(8):1069-1071.
- Hoste H, Chilton NB, Gasser RB, Beveridge I. Differences in the second internal transcribed spacer (ribosomal DNA) between five species of *Trichostrongylus* (Nematoda: Trichostrongylidae). Int J Parasitol. 1995;25(1):75-80.
- Jungmann P, Figueiredo-Silva J, Dreyer G. Bancroftian lymphangitis in northeastern Brazil: a histopathological study of 17 cases. J Trop Med Hyg. 1992;95 (2):114-118.
- Kane RA, Rollinson D. Repetitive sequences in the ribosomal DNA internal transcribed spacer of *Schistosoma haematobium*, *Schistosoma intercalatum* and *Schistosoma mattheei*. Mol Biochem Parasitol. 1994;63:153-156.
- Kanjanopas K. The susceptibility of some strains *Culex quinquefasciatus* in Thailand to nocturnal periodic *Wuchereria bancrofti*. J Med Pub Health. 1997;27 (3):169-177.
- Kumeda Y, Asao T. Single-strand conformation polymorphism analysis of PCR-amplified ribosomal DNA internal transcribed spacers to differentiate species of *Aspergillus* section *Flavi*. Appl Environ Microbiol. 1996;62(8):2947-2952.
- Lalev AI, Abeyrathne PD, Nazar RN. Ribosomal RNA Maturation in *Schizosaccharomyces pombe* is dependent on a large ribonucleoprotein complex of the internal transcribed spacer 1. J Mol Biol. 2000;302:65-77.
- Lizotte MR, Supali T, Partono F, Williams SA. A polymerase chain reaction assay for the detection of *Brugia malayi* in blood. Am J Trop Med Hyg. 1994;51 (3):314-321.

- Long EO, Dawid IB. Repeated genes in eukaryotes. *Ann Rev Biochem*. 1980; 49:727-764.
- McKeand JB. Molecular diagnosis of parasitic nematodes. *Parasitology* 1998;117 Suppl:S87-96.
- Michael E, Bundy DAP, Grenfell BT. Re-assessing the global prevalence and distribution of lymphatic filariasis. *Parasitology*. 1996;112 (Pt4):409-428.
- Morales-Hojas R, Post RJ, Shelley AJ, Maia-Herzog M, Coscaron S, Cheke RA. Characterisation of nuclear ribosomal DNA sequences from *Onchocerca volvulus* and *Mansonella ozzardi* (Nematoda: Filarioidea) and development of a PCR-based method for their detection in skin biopsies. *Int J Parasitol*. 2001;31(2):169-177.
- Morgan UM, Constantine CC, Forbes DA, Thompson RC. Differentiation between human and animal isolates of *Cryptosporidium parvum* using rDNA sequencing and direct PCR analysis. *J Parasitol* 1997;83(5):825-830.
- Morgan UM, Deplazes P, Forbes DA, Spano F, Hertzberg H, Sargent KD, Elliot A, Thompson RCA. Sequence and PCR-RFLP analysis of the internal transcribed spacers of the rDNA repeat unit in isolates of *Cryptosporidium* from different hosts. *Parasitology*. 1999;118:49-58.
- Musters W, Boon K, van der Sande CA, van Heerikhuizen H, Planta RJ. Functional analysis of transcribed spacers of yeast ribosomal DNA. *EMBO J*. 1990;9 (12):3989-3996.
- Newton LA, Chilton NB, Beveridge I, Hoste H, Nansen P, Gasser RB. Genetic markers for strongylid nematodes of livestock defined by PCR-based restriction analysis of spacer rDNA. *Acta Trop*. 1998;69:1-15.
- Nithiuthai S, Chungpivat S. Lymphatic filariasis (*Brugia pahangi*) in dogs. *J Thai Vet Pract*. 1992;4(3-4): 122-133.
- Nuchprayoon S, Yentakam S, Sangprakarn S, Junpee A. Endemic bancroftian filariasis in Thailand: detection by Og4C3 antigen capture ELISA and the polymerase chain reaction. *J Med Assoc Thai*. 2001;84(9):1300-1307.
- Olszewski WL, Jamal S, Manokaran G, Pani S, Kumaraswami V, Kubicka U, Lukomska B, Dworczynski A, Swoboda E, Meisel-Mikolajczyk F. Bacteriologic studies of skin, tissue fluid, lymph, and lymph nodes in patients with filarial lymphedema. *Am J Trop Med Hyg*. 1997;57(1):7-15.

- Ottesen EA, Duke BOL, Karam M, Behbehni K. Strategies and tools for the control/elimination of lymphatic filariasis. Bull World Health Organ. 1997;75:491-503.
- Perry RP. Processing of RNA. Annu Rev Biochem. 1976;45:605-629.
- Phantana S, Shutidamrong S, Chusattayanond W. *B. malayi* in a cat from southern Thailand. Trans R Soc Trop Med Hyg. 1987; 81:173-174.
- Ramachandran S, Gam AA, Neva FA. Molecular differences between several species of *Strongyloides* and comparison of selected isolates of *S. stercoralis* using a polymerase chain reaction-linked restriction fragment length polymorphism approach. Am J Trop Med Hyg. 1997; 56(1):61-65.
- Ramaiah KD, Ramu K, Kumar KN, Guyatt H. Epidemiology of acute filarial episodes caused by *Wuchereria bancrofti* infection in two rural villages in Tamil, Nadu, south India. Trans R Soc Trop Med Hyg. 1996;90(6):639-643.
- Ramaiah KD, Das PK, Michael E, Guyatt H. The economic Burden of Lymphatic filariasis in India. Parasitol Today. 2000;16(6):251-253.
- Reno HE, Vodkin MH, Novak RJ. Differentiation of *Aedes triseriatus* (Say) from *Aedes hendersoni* Cockerell (Diptera: Culicidae) by restriction fragment length polymorphisms of amplified ribosomal DNA. Am J Trop Med Hyg. 2000;62(2):193-199.
- Ritossa FM, Scala G. Equilibrium variations in the redundancy of rDNA in *Drosophila melanogaster*. Genetics 1969;61(1):Suppl:305-317.
- Rocha A, Addiss D, Ribeiro ME, Noroes J, Baliza M, Medeiros Z, Dreyer G. Evaluation of the Og4C3 ELISA in *Wuchereria bancrofti* infection: infected persons with undetectable or ultra-low microfilarial densities. Trop Med Int Health 1996;1(6):859-864.
- Romstad A, Gasser RB, Nansen P, Polderman AM, Monti JR, Chilton NB. Characterization of *Oesophagostomum bifurcum* and *Necator americanus* by PCR-RFLP of rDNA. J Parasitol. 1997;83(5):963-966.
- Siboe GM, Murray J, Kirk PM. Genetic similarity among *Cercospora apii*-group species and their detection in host plant tissue by PCR/RFLP analyses of the rDNA internal transcribed spacer (ITS). J Gen Appl Microbiol. 2000;46(2):69-78.
- Singh B. Molecular methods for diagnosis and epidemiological studies of parasitic

- infections. *Int J Parasitol.* 1997;27(10):1135-1145.
- Spear BB, Gall JG. Independent control of ribosomal gene replication in polytene chromosomes of *Drosophila melanogaster*. *Proc Natl Acad Sci U S A.* 1973;70(5):1359-1363.
- Sumethvanich C, Choochote W, Panart K, Jitpakdi A, Panart P. Comparative morphometry of nocturnally periodic and subperiodic *Wuchereria bancrofti* microfilariae. *J Trop Med Parasitol.* 1996;19(1):55-60.
- Stevenson LA, Chilton NB, Gasser RB. Differentiation of *Haemonchus placei* from *H. contortus* (Nematoda: Trichostrongylidae) by the ribosomal DNA second internal transcribed spacer. *Int J Parasitol.* 1995;25(4):483-488.
- Tantravahi R, Miller DA, Dev VG, Miller OJ. Detection of nucleolus organizer regions in chromosomes of human, chimpanzee, gorilla, orangutan and gibbon. *Chromosoma.* 1976;56(1):15-27.
- Thanomsub BW, Chansiri K, Sarataphan N, Phantana S. Differential diagnosis of human lymphatic filariasis using PCR-RFLP. *Mol Cell Probes.* 2000;14:41-46.
- Theis JH, Gilson A, Simon GE, Bradshaw B, Clark D. Case report: Unusual location of *Dirofilaria immitis* in a 28-year-old man necessitates orchietomy. *Am J Trop Med Hyg.* 2001;64(5-6):317-322.
- Triteeraprapab S, Thumpanyawat B, Sangprakarn S. *Wuchereria bancrofti*-specific circulating antigen for diagnosis of bancroftian filariasis. *Chula Med J.* 1998;42(8):267-277.
- Triteeraprapab S, Songtrus J. High prevalence of bancroftian filariasis in Myanmar migrant workers: A study in Mae Sot district, Tak province, Thailand. *J Med Assoc Thai.* 1999; 82 (7):734-739.
- Triteeraprapab S, kanjanopas K, Suwannadabba S, Sangprakarn S, Poovorawan Y, Scott AL. Transmission of the nocturnal periodic strain of *Wuchereria bancrofti* by *Culex quinquefasciatus* : establishing the potential for urban filariasis in Thailand. *Epidemiol Infect.* 2000;125 (1):207-212.
- Triteeraprapab S, Nuchprayoon I, Porksakorn C, Poovorawan Y, Scott AL. High prevalence of *Wuchereria bancrofti* infection among Myanmar migrants in Thailand. *Ann Trop Med Parasitol.* 2001a;95 (5):535-538.
- Triteeraprapab S, Kanjanopas K, Porksakorn C, Sai-ngam A, Yentakam S, Loymak S.

- Lymphatic filariasis caused by *Brugia malayi* in an endemic area of Narathiwat Province, Southern of Thailand. J Med Assoc Thai. 2001b;84 (suppl):S182-S188.
- Ubelaker JE. Stedman's ASP parasite names. Baltimore, USA: Williams & Wilkins, 1993.
- Verweij JJ, Polderman AM, Wimmenhove MC, Gasser RB. PCR assay for the specific amplification of *Oesophagostomum bifurcum* DNA from human faeces. Int J Parasitol. 2000;30(2):137-142.
- Wallace H, Birnstiel ML. Ribosomal cistrons and the nucleolar organizer. Biochim Biophys Acta 1966;114(2):296-310.
- Weil GJ, Ramzy RM, Chandrashekhar R, Gad AM, Lowrie RC Jr, Faris R. Parasite antigenemia without microfilaremia in bancroftian filariasis. Am J Trop Med Hyg. 1996;55(3):333-337.
- Williams SA, Nicolas L, Lizotte-Waniewski M, Plachart C, Luquiaud P, Nguyen LN, Moulia-Pelat JP. A polymerase chain reaction assay for the detection of *Wuchereria bancrofti* in blood samples from French Polynesia. Trans R Soc Trop Med Hyg. 1996 ;90(4):384-387.
- World Health Organization. Lymphatic filariasis: The disease and its control. Fifth report of the WHO expert Committee on Filariasis. WHO Technical Report Series. 1992;821.
- World Health organization. World health report. 1995 WHO Geneva.
- World Health Organization. Elimination filariasis: Attack poverty. The global alliance to eliminate lymphatic filariasis proceedings of the first meeting. Santiago de Compostela, Spain 4-5 May 2000. A greenlight from the global alliance. WHO. Geneva.
- Yen PKF, Mak JW. Histochemical differentiation of *Brugia*, *Wuchereria*, *Dirofilaria* and *Breinlia* microfilariae. Ann Trop Med Parasitol. 1978;72(2):157-162.
- Zhu X, Gasser RB, Podolska M, Chilton NB. Characterisation of anisakid nematodes with zoonotic potential by nuclear ribosomal DNA sequences. Int J Parasitol. 1998;28(12):1911-1921.
- Zhu X, Chilton NB, Jacobs DE, Boes J, Gasser RB. Characterisation of *Ascaris* from

human and pig hosts by nuclear ribosomal DNA sequences. Int J Parasitol. 1999;29(3):469-478.

Zhong M, McCarthy J, Bierwert L, Lizotte-Waniewski M, Chanteau S, Nutman TB, Ottesen EA, Williams SA. A polymerase chain reaction assay for detection of the parasite *Wuchereria bancrofti* in human blood samples. Am J Trop Med Hyg. 1996;54(4):357-363.



# APPENDIX

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

## **APPENDIX**

### **CHEMICAL AGENTS AND INSTRUMENTS**

#### **A. Research Instruments**

- Pipette tip (Elkay, USA)
- Microcentrifuge tube (Bio-rad, Elkay, USA)
- Polypropylene conical tube (Elkay, USA)
- Beaker (Pyrex)
- Flask (Pyrex)
- Reagent bottle (Duran)
- Cylinder (Witeg, Germany)
- Glass Pipette (Witeg, Germany)
- Pipette rack (Autopack, USA)
- Thermometer (Precision, Germany)
- Parafilm (American National Can, USA)
- Plastic wrap
- Aluminum Foil
- Combs
- Electrophoresis Chamber set
- Power supply model
- Automatic adjustable micropipette (Eppendorf, Germany)
- Pipette boy (Tecnomara, Switzerland)
- Vortex (Scientific Industry, USA)
- pH meter (Eutech Cybernataics)
- Balance (Precisa, Switzerland)
- Microcentrifuge
- DNA Thermal cycler 2400 (Perkin Elmer, Cetus USA)
- Heat block (Bockel Scientific)
- Chemi Doc (Bio-rad, USA)
- Thermal Paper
- Water bath

## B. Sample Collection Instruments

Microscope (Olympus)

Microscope slides

Cover slip

Syringe (Nipro)

Needle (Nipro)

## C. General Reagents

Absolute ethanol (Merck)

70% Ethanol

Acetic acid (Merck)

Agarose (USB, Spain)

Bromphenol blue (Sigma, USA)

Chloroform (Merck)

Disodium ethylenediamine tetraacetic acid: EDTA

Ethidium bromide (Gibco BRL, USA)

Glycogen (USB, Japan)

Hydrochloric acid (Merck)

Isoamyl alcohol (Merck)

Phenol (Sigma, USA)

Proteinase K (Pharmacia Amersham)

Sodium Acetate

Sodium Hydroxide

Sucrose (Sigma, USA)

Tris base (USB)

Triton X-100 (Sigma, USA)

Tween 20 (Sigma, USA)

100 bp DNA ladder (NEB)

## D. Reagents of PCR

10X PCR buffer (500 mM KCl, 200 mM Tris-HCl pH 8.4, 15 mM MgCl<sub>2</sub>)  
(Pharmacia Amersham)

Deoxynucleotide triphosphates (dNTPs) (Promega)

Oligonucleotide primer (BSU)

*Taq* DNA polymerase (Amersham Phamacia)

### E. Restriction endonucleases

Table 2: Restriction enzymes with their recognition sites, recommended buffer and manufacturer.

| Enzymes       | Recognition sequence  | Buffer     | Manufacturer           |
|---------------|---|------------|------------------------|
| <i>Acc</i> I  | 5'..GT <sup>^</sup> ATAC..3' or<br>5'..GT <sup>^</sup> CGAC..3' | NEBuffer 4 | New England<br>Biolabs |
| <i>Ase</i> I  | 5'..AT <sup>^</sup> TAAT..3'                                    | NEBuffer 3 | New England<br>Biolabs |
| <i>Hinf</i> I | 5'..G <sup>^</sup> ANTC..3'                                     | NEBuffer 2 | New England<br>Biolabs |
| <i>Rsa</i> I  | 5'..GT <sup>^</sup> AC..3'                                      | NEBuffer 1 | New England<br>Biolabs |

NOTE: ^ represent the cleavage site of restriction enzyme

## BIOGRAPHY

|                       |  |                   |
|-----------------------|--|-------------------|
| <b>Name</b>           | Songpun Sangprakarn  | <b>Sex</b> Female |
| <b>Birth date</b>     | July 11, 1977  | <b>Age</b> 24     |
| <b>Nationality</b>    | Thai   |                   |
| <b>Place of birth</b> | Bangkok , Thailand   |                   |
| <b>Home Address</b>   | 36/20 Soi Ramintra 10, Ramintra Rd, Bangkhen,<br>Bangkok, 10220 Thailand |                   |

**Education**

1997 : Degree of Bechelor of Science (Medical Technology)  
Chulalongkorn University

**Publications**

1. Triteeraprapab S, Thumpanyawat B, **Sangprakarn S**. *Wuchereria bancrofti*- specific circulating antigen for diagnosis of bancroftian filariasis. Chula Med J. 1998;42: 267-277.
2. Triteeraprapab S, Kanjanopas K, Suwannadabba S, **Sangprakarn S**, Poovorawan Y and Scott AL. Transmission of the nocturnal periodic strain of *Wuchereria bancrofti* by *Culex quinquefasciatus*: Establishing the potential for urban filariasis in Thailand. Epidemiol Infect. 2000;125(1):207-212.
3. Nuchprayoon S, Yentakam S, Porksakorn C, **Sangprakarn S**, Junpee A. Bancroftian Filariasis in An Endemic Area of Thailand: Diagnosis by using Og4C3 Antigen Capture ELISA and a Polymerase Chain Reaction Assay. J Med Assoc Thai. 2001;84(9):1300-1307.

**Abstracts and presentations**

1. Triteeraprapab S, Thoophom P, Sangprakarn S, Porksakorn C, Poovorawan Y. 1999 Detection of *Wuchereria bancrofti* in *Culex quinquefasciatus* using a PCR-based assay. 40<sup>th</sup> Annual Meeting, Faculty of Medicine, Chulalongkorn University. 22-26 March, 1999
2. Sangprakarn S, Triteeraprapab S, Porksakorn C, Poovorawan Y. 1999 Detection of *Wuchereria bancrofti* in Myanmar migrants using Og4C3 monoclonal antibody. 40<sup>th</sup> Annual Meeting, Faculty of Medicine, Chulalongkorn University. 22-26 March, 1999
3. Triteeraprapab S, Sriratanaban J, Triteeraprapab N, Sangprakarn S, Wongcharoenyong S, Sitthiamorn C. 2000 The cost-effectiveness of Antigen-capture ELISA, IgG4 antibody, and PCR assays in detecting bancroftian filariasis in Myanmar migrants. 41<sup>st</sup> Annual Meeting, Faculty of Medicine, Chulalongkorn University. 20-24 March, 2000
4. Sangprakarn S, Triteeraprapab S, Triteeraprapab N, Poovorawan Y. 2000 Epidemiology of Bancroftian Filariasis among Myanmar workers in Tak province, Thailand. 41<sup>st</sup> Annual Meeting, Faculty of Medicine, Chulalongkorn University. 20-24 March, 2000