

ห้องสมุดงานวิจัย สำนักงานคณะกรรมการการวิจัยแห่งชาติ



E47356



AN ACCURACY COMPARISON OF SOLUTIONS BETWEEN BOUNDARY
ELEMENT METHOD AND MESHLESS METHOD
FOR LAPLACE EQUATION

MISS NISSAYA CHUATEONG

A THESIS FOR THE DEGREE OF MASTER OF SCIENCE
KHON KAEN UNIVERSITY

2011

600254903

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OPISTHORCHIS VIIVERRINI INFECTIONS IN HAMSTER AND GERBIL: MORPHOLOGY, BIOLOGY AND PATHOLOGY



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MISS ORASA WONKCHALEE

**A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE
IN PARASITOLOGY**

GRADUATED SCHOOL KHON KAEN UNIVERSITY

2011



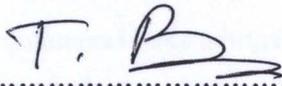
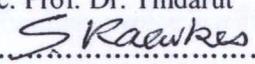
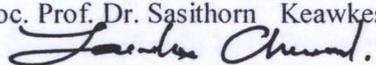
THESIS APPROVAL
KHON KAEN UNIVERSITY
FOR
MASTER OF SCIENCE
IN PARASITOLOGY

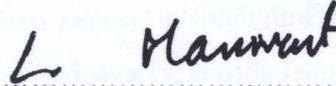
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อรสา วงศ์ชาติ. 2554. การคิดเชื้อพยาธิใบไม้ตับ ในหนูแฮมสเตอร์และเจอร์บิล: รูปร่าง ชีวิตวิทยาของปรสิต และพยาธิสภาพ. วิทยานิพนธ์ปริญญาวิทยาศาสตรมหาบัณฑิต สาขาวิชาปรสิตวิทยา บัณฑิตวิทยาลัย มหาวิทยาลัยขอนแก่น.

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บทคัดย่อ

E47357

การคิดเชื้อพยาธิใบไม้ตับ (*Opisthorchis viverrini*) มีความสัมพันธ์กับการเกิดพยาธิสภาพที่ตับและระบบท่อน้ำดี สำหรับการคิดเชื้อพยาธิใบไม้ตับพบได้ทั้งที่แสดงอาการและไม่แสดงอาการของโรค ทั้งนี้เกิดจากความหลากหลายและความแตกต่างของโฮสต์ ดังนั้นวัตถุประสงค์ของการศึกษาค้นคว้าครั้งนี้จึงทำการศึกษาเปรียบเทียบชีวิตวิทยาและการเจริญเติบโตของปรสิต ได้แก่ ปริมาณไข่ต่อมูลกรัม (eggs per gram) ปริมาณไข่ต่อตัวปรสิต (eggs per worm) จำนวนของปรสิตทั้งหมดต่อหนูคิดเชื้อ (worm recovery) ขนาดลำตัวและอวัยวะภายในของปรสิต (body and internal organs measurement) ความแตกต่างขององค์ประกอบน้ำดีโดยเทคนิคโครมาโทกราฟีแบบทินเลเยอร์ (Thin-layer chromatography) การทำงานของเอนไซม์ตับ รวมไปถึงการเปลี่ยนแปลงลักษณะทางพยาธิวิทยา โดยใช้สัตว์ทดลองสองชนิดคือ หนูแฮมสเตอร์และหนูเจอร์บิลอายุ 6-8 สัปดาห์ มาคิดเชื้อพยาธิใบไม้ตับ หลังจากนั้นเก็บตัวอย่างน้ำดี ตับ และอุจจาระเพื่อนำมาใช้ในการศึกษาค้นคว้า

ผลการศึกษาพบว่าปริมาณไข่ต่อมูลกรัม (eggs per gram) ปริมาณไข่ต่อตัวปรสิต (eggs per worm) ของหนูเจอร์บิลคิดเชื้อมีแนวโน้มปริมาณที่มากกว่าหนูแฮมสเตอร์คิดเชื้อ แต่หนูเจอร์บิลคิดเชื้อมีปริมาณของปรสิตทั้งหมด (worm recovery) น้อยกว่าหนูแฮมสเตอร์คิดเชื้อ ซึ่งปริมาณไข่ต่อมูลกรัม (eggs per gram) หรือปริมาณไข่ต่อตัวปรสิต (eggs per worm) มีความสัมพันธ์กับขนาดของอวัยวะสืบพันธุ์และอวัยวะภายในของปรสิตที่มีขนาดใหญ่กว่า โดยหนูเจอร์บิลคิดเชื้อทุกช่วงอายุพบว่าปรสิตมีขนาดของอวัยวะสืบพันธุ์ที่ใหญ่กว่าเมื่อเปรียบเทียบกับปรสิตจากหนูแฮมสเตอร์คิดเชื้อที่ช่วงอายุเดียวกัน ในการศึกษาครั้งนี้จำนวนของปรสิตทั้งหมด (worm recovery) แปรผกผันกับปริมาณไข่ต่อมูลกรัม (eggs per gram) และปริมาณไข่ต่อตัวปรสิต (eggs per worm) เนื่องจากจำนวนปรสิตทั้งหมด (worm recovery) ที่ได้จากหนูเจอร์บิลคิดเชื้อมีปริมาณน้อยกว่าเมื่อเทียบกับหนูแฮมสเตอร์ ส่วนผลการศึกษาทางพยาธิวิทยาพบว่าหนูเจอร์บิลคิดเชื้อมีความแตกต่างอย่างมีนัยสำคัญจากหนูแฮมสเตอร์ จากการสังเกตด้วยตาเปล่าคือ ผนังน้ำดีขยายขนาดเพิ่มมากขึ้น ท่อน้ำดีมีการหนาตัวและขุ่นเพิ่มมากขึ้น และผิวหนังมีลักษณะขรุขระเพิ่มมากขึ้นตามระยะเวลาของการคิดเชื้อ ตำแหน่ง จำนวน และขนาดของปรสิต และจากการสังเกตภายใต้กล้องจุลทรรศน์ พบว่ามีความสัมพันธ์กับพยาธิสภาพที่สังเกตด้วยตาเปล่า

Orasa Wonkchalee. 2011. *Opisthorchis viverrini* Infections In Hamster And Gerbil: Morphology, Biology and Pathology. Master of Science Thesis in Parasitology, Graduate School, Khon Kaen University.

Thesis Advisors: Assoc. Prof. Dr. Thidarut Boonmars,
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Dr. Yaovalux Chamgramol

ABSTRACT

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Liver fluke infection associated with many pathogenesis of the hepatobiliary system; there are symptomatic and asymptomatic diseases, which may be observed in the same and/or different host. Therefore, the purpose of the present study is to compare parasite growth including eggs per gram of feces, eggs per worm, worm recovery, body size and internal organs of adult worm, bile fluid components by thin-layer chromatography, liver function test and pathological changes in experimental animals. In this study 6-8 weeks old, male hamsters and gerbils were infected with *O. viverrini* metacercariae and then sacrificed at day 30, 60 and 90 post-infection. Bile fluids, liver and feces of each infected animal were collected and then processed for analysis.

The results showed that eggs per gram of feces and eggs per worm from all infected gerbils were higher than infected hamsters. The volume of eggs per gram of feces and eggs per worm related to the parasite size and reproductive organs of parasite. The parasites from infected gerbils were larger size and reproductive organs than parasites from infected hamsters. The results of the gross pathology and histopathology of hepatobiliary system were significantly different between gerbil and hamster. Gross appearances showed the size of gallbladder of infected gerbil was enlarged. The increasing of thickening wall of common bile duct and micronodular were observed at the liver surface of infected gerbil which depended on the duration of infection, parasite location, the amount and size of the parasite. Histopathological results correlated with the gross appearance of infected gerbils and more severe as could be seen by the fibrosis surrounding the portal area. There was no parasite observed in intrahepatic bile duct of the infected gerbils. Moreover, bile acid

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components, cholic acid and chenodeoxycholic acid, were observed in hamster but not gerbil. This present study suggests that *O. viverrini* infection in different host may cause different pathology and parasite susceptibility as that observed in hamster and gerbil.

Good Porting to Present Study is Dedicated

For My Parents and Entire Teaching Staff

ACKNOWLEDGEMENT

I would like to express my respect and sincere gratitude to my advisor, Associate Professor Dr. Tazim A. Khattar for her valuable steering and supervision, extensive assistance, helpfulness, guidance and the entire laboratory facilities throughout the study.

I would like to express my sincere gratitude and appreciation to Associate Professor Dr. Samir A. Karam and Dr. Yasmin Chaudhary for their valuable assistance and critical monitoring of the study, extending encouragement and moral support throughout my study. I deeply appreciate the award of scholarship toward the funding the preparation of this thesis.

I am indebted to Associate Professor Dr. Ghazwan Al-Jarrah for his kindness toward a special influence. My huge appreciation and gratitude Professor Ghassan Hammad M.D. for his special assistance in providing the data and equipment used in the study.

**Good Portion to Present Thesis is Dedicated
For My Parents and Entire Teaching Staff**

I would like to thank my dear friend, Dr. Ghassan Hammad M.D. for his kindness and support of my research funding and Department of Physiology for providing me the opportunity to conduct my study.

My gratitude is expressed to all my teachers and other members of Department of Physiology for their valuable teaching facilities and knowledge during the period 2022-23.

Special thanks are expressed to my friends, research members and graduate students of Department of Physiology, Faculty of Medicine and Faculty of Pharmacy, Yarmouk University for making their knowledge available while my researching and for their love and helpful support.

I also would like to thank the Faculty of Medicine for a wonderful year of the study. Finally, I would like to express my deepest appreciation to my dear parents and my family for their love, understanding, encouragement, and help throughout my study.

Yarmouk University

ACKNOWLEDGEMENT

I would like to express my deepest and sincere gratitude to my advisor, Associate Professor Dr. Thidarut Boonmars for her valuable advices and supervision, kindness, forbearance, helpfulness, guidance and the entire laboratory facilities throughout my study.

I would like to express my deepest gratitude and appreciation to Associate Professor Dr. Sasithron Kaewkes and Dr. Yaovalux Chamgramol for their valuable supervision and advices, encouraging guidance, kindness, extremely forbearance and constructive criticism throughout my study. I deeply appreciate the precious time they spared me during the preparation of this thesis.

I am indebted to Associate Professor Dr. Chantana Aromdee for her kindness support in special technique, Thin-layer chromatography and Associate Professor Chawalit Pairojkul, M.D. for his suggestion in histopathology. Sincere thanks and appreciation is also addressed to my graduate committee, Associate Professor Dr. Smarn Tesana and Associate Professor Dr. Chaturong Putaporntip for being my extra committee and giving helpful suggestion.

I wish to express my sincere thanks to Graduate School of Khon Kaen University for supporting all my research funding and Department of Parasitology for providing me the opportunity to continue my study.

My grateful is expressed to all my teachers and other members of Department of Parasitology for their valuable teaching, facilities and friendship during the time of this study.

Special thanks are expressed to my friends, laboratory members and graduate students of Department of Parasitology, Faculty of Medicine and Faculty of Pharmacy, Khon Kaen University, for sharing their knowledge, experience while we were studying and for all of their kind helps and supports.

I also wish to thanks the Faculty of Medicine for research grant of this study.

Finally, I would like to express my deepest appreciation to my dear parents and my family for their love, understanding, encouragement, and forbearance during my long time study.

Orasa Wonkchalee

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| Figure 35 Histopathological changes of liver. Uninfected normal control hamsters (A; B) and gerbils (C; D) compared with the infected hamsters and gerbils at 30 (E; F; G; H), 60 (I; J; K; L) and 90 days post-infection (M; N; O; P). Lane 1, 3; Gomori's trichrome stain; | 61 |
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LIST OF ABBREVIATIONS

| | |
|------------------|-------------------------------------|
| / | Per |
| ° C | Degree Celsius |
| ALP | Alkaline phosphatase |
| ALT | Alanine transaminase |
| CA | Cholic acid |
| Ca ²⁺ | Calcium ion |
| cAMP | Cyclic adenosine monophosphate |
| CCA | Cholangiocarcinoma |
| CDCA | Chenodeoxycholic acid |
| cm | Centimeter (s) |
| CYP7A1 | Cholesterol-7 α -hydroxylase |
| CYP27A1 | Sterol 27 α -hydroxylase |
| DCA | Deoxycholic acid |
| Dpi | Days post-infection |
| EPG | Eggs per gram of feces |
| g | Gram (s) |
| H | Hyodeoxycholic acid |
| H&E | Hematoxylin and eosin |
| hr | Hour (s) |
| LTA | Lithocholic acid |
| mg | Milligram (s) |
| mg/ml | Milligram (s) per milliliter |
| ml | Milliliter (s) |
| mm | Millimeter (s) |
| n | Number |
| nmol/g | Nanomole per gram |
| pg | Picogram (s) |
| P-P | Portal to portal bridge |
| P-C | Portal to central bridge |
| PI3K | Phosphoinositide 3-kinase |

LIST OF ABBREVIATIONS (Cont.)

| | |
|----------------|------------------------------|
| PKC | Protein kinase C |
| R _f | Retardation factor |
| rpm | Round per minute |
| SER | Smooth endoplasmic reticulum |
| TLC | Thin-layer chromatography |
| UDCA | Ursodeoxycholic acid |
| UV | Ultraviolet |
| v/v | Volume by volume |
| w/v | Weight by volume |
| μl | Microliter (s) |
| μm | Micrometer (s) |