Parasitological and Biochemical Studies on The Efficacy of Praziquantel Treatment on Mice Infected With *Hymenolepis nana*

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Presented to The Medical Research Institute
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In Partial Fulfillment of the
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of

Master

in

Applied Medical Chemistry

By

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B.SC. Chemistry/Zoology
Mansoura University

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دراسات طفيلية وبيوكيميائية عن تأثير عقار البرازيكونتال فى الفئران المصابة بالهيمنيوليبس نانا

رسالة علمية

مقدمة إلى معهد البحوث الطبية– جامعة الإسكندرية
إستيفاء للدراسات المقررة للحصول على درجة

الماجستير

فى

الكيمياء الطبية التطبيقية

مقدمة من

محمد الشحات المتولى شومان

بكالوريوس علوم ، كيمياء وحيوان، جامعة المنصورة، ١٩٩٥

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لجنة المناقشة والحكم على الرسالة **موافقون**

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LIST OF ABBREVIATION

ADP	**:**	Adenosine diphosphate.
AOE	**:**	Antioxidant enzyme.
AP-1	**:**	Activated protein-1.
BLC	**:**	Bovine Liver catalase.
Ca^{2+}	**:**	Calcium ion.
CAT	**:**	Catalase.
CGPX	**:**	Cytosolic glutathione peroxidase.
C-H bonds	**:**	Carbon-Hydrogen bonds.
CHD	**:**	Coronary heart disease.
CL	**:**	Chemiluminescence.
Cu	**:**	Cupper.
DNA	**:**	Deoxyribonucleic acid.
EC	**:**	Enzyme code.
Ec-SOD	**:**	Extracellular-superoxide dismutase.
Fe	**:**	Iron.
Fe O^{2+}	**:**	Ferryl radical.
G:C	**:**	Guanine-cytosine bond.
GPX	**:**	Glutathione peroxidase.
H.diminuta	**:**	Hymenolepis diminuta.
H.nana	**:**	Hymenolepis nana.
H_2O_2	**:**	Hydrogen peroxide.
HIF	**:**	Hypoxia-induced factor.
HIV	**:**	Human immunodeficiency virus.
HPII	**:**	Hydroperoxidase II.
H-pylori	**:**	Helicobacter pylori.
IFN-γ	**:**	Interferon-gamma.
IgE	**:**	Immunoglobulin E.
IL-2	**:**	Interleukin-2.
KD	**:**	Kilo Dalton.
LDL	**:**	Low density lipoprotein.
MAP	**:**	Mitogen-activated protein.
MLC	**:**	Micrococcus lysodeikticus catalase.
Mn	**:**	Manganese.
Mn-SOD	**:**	Manganese superoxide dismutase.
MPO	**:**	Myeloperoxidase.
MRI	**:**	Medical research institute.
mRNA	**:**	Messenger ribonucleic acid.
NADPH-oxidase	**:**	Nicotinamide adenine dinucleotide phosphate-oxidase.
NF-KB	**:**	Necrosis Factor-$_k$B.
Ni	**:**	Nicle.
$NO_2^{\bullet -}$	**:**	Nitric oxide radical.

O_2	**:**	Molecular oxygen.
$ONOO^{\bullet-}$	**:**	Peroxynitrite.
$O_2^{\bullet-}$	**:**	Superoxide anion radical.
$^{\cdot}OH$	**:**	Hydroxyl radical.
P.I	**:**	Post-infection.
P^{53}	**:**	Tumor-suppressor gene P^{53}.
PDGF	**:**	Platelet-derived growth factor.
PHGPX	**:**	Phospholipid hydroperoxide glutathione peroxidase.
PMC	**:**	Proteus mirabilis catalase.
PMNs	**:**	Polymorph nuclear leukocytes.
PTPases	**:**	Protein tyrosine phosphatases.
PUFA	**:**	Polyunsaturated fatty acid.
PVC	**:**	Penicillium vitale catalase.
PZQ	**:**	Praziquantel.
RNS	**:**	Reactive nitrogen species.
$ROO^{\cdot}$	**:**	Alkoxy radical.
ROS	**:**	Reactive oxygen species.
rpm	**:**	Round per min.
RSOO	**:**	Thiyl peroxyl radical.
SOD	**:**	Superoxide dismutase.
Th-1	**:**	T helper cells-1.
WHO	**:**	World health organization.

LIST OF CONTENTS

Chapter Page

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

Classification and nomenclature

The tapeworm *Hymenolepis nana* was first described as *Taenia nana* by Von Siebold in 1852 as a parasite found in humans. In 1906 Stiles described as a morphologically identical parasite from a rodent host and named it *Hymenolepis nana* var *fraterna*.[1]

Hymenolepis nana (*H. nana*) is classified under the family Hymenolepididae, subclass Eucestoda. According to Vaucher characters such as "the presence or absence of rostellar hooks, the hook number and shape, the presence of a pseudoscolex, the spination of the suckers, the external segmentation, the shape and distribution of the microtriches, the number of testes, the shape of the ovary and, in some cases, the development and shape of the 'uterus' are important generic characteristics.[2]

Armed *Hymenolepis* species (hooks present) with their testes arranged in a straight line, the ovary not separating the testes, were therefore placed into the genus *Vampirolepis spasskii* 1954. Other armed *Hymenolepis* species from mammals with their testes arranged in an elongated triangle separated by the female gonads were placed into the genus *Rodentolepis.*[2]

According to Spasskii[3], the correct taxonomic nomenclature for *Hymenolepis nana* is: *Rodentolepis nana, Taenia nana, Hymenolepis nana fraterna*.

However, the current classifications outlined recently are summarized in Table (1). For the remainder of this thesis, *Hymenolepis* will be adopted as the preferred nomenclature for the genus, rather than *Rodentolepis*.

Table (1): Classification of *Hymenolepis*[4,5]

Classification level	Nomenclature
Phylum	Platyhelminthes
Class/ Cohort	Cestoidea
Subclass/ sub cohort	Eucestoda
Order	Cyclophyllidea
Family	Hymenolepididae
Genus	*Hymenolepis*, *Rodentolepis*

Morphology and physiology of the Adult Worm

H. nana adult worms are characterized by the dorso-ventrally flattened shape of the Platyhelminths. Linnaeus first assigned the eucestodes into one genus, *Taenia*, from the Greek word meaning "ribbon" or "tape"[6] a morphological feature considered highly suitable for its growth and development in the "tubular" shaped confined environment of the alimentary canal of its definitive host.[7] The adult worm is formed of a scolex, a neck region, and a strobila (body) which consists of numerous repeating proglottids (segments)[8]. The adult worm grows to approximately 3-4 cm[9] although this has been shown to vary depending on the host type.[10] In *H. nana*, the anterior tip of the scolex (rostellum) consists of four muscular "suckers" and a