

**Parasitological & Ultrastructural study of the effect of
Probiotics, Oregano oil and *Quillaja saponaria* on
Isolated**

Blastocystis hominis

Thesis

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



To my dearly beloved parents

To my husband

To my sisters and brother

To my firend Dr.Rasmia

without their everlasting love,
encouragement & sacrifices, this
work would never have been
completed

Abstract

Blastocystis is a protozoan parasite that inhabits the human intestinal tract. Various epidemiological surveys have recorded 50-60% prevalence in developing countries. Nitazoxanide is a commonly used drug in treatment of *Blastocystis* infection especially in metronidazole treatment failure. However, undesirable side effects and treatment failures were reported.

To investigate the effect of probiotics, Oregano oil and *Quillaja saponaria* (QS) as natural compounds against isolated *Blastocystis* in comparison to nitazoxanide, fresh stools samples positive for *Blastocystis* were processed for in vitro cultivation using Locke serum media. Three criteria were used to test the drug's efficacy, Living cell count (LCC), Living cell rate (LCR) and ultra-structure changes as seen by transmission electron microscope (TEM).

All the tested compounds used at higher concentrations showed a significant reduction in both LCC and LCR with p value < 0.001 and significant ultra-structural changes as seen by TEM. The tested compounds were arranged according to their LCR % on day one as follows: QS (1000 $\mu\text{g/ml}$) (47.1%), oregano oil (3200 $\mu\text{g/ml}$) (49.5%), probiotics (500 $\mu\text{g/ml}$) (57.0%) and nitazoxanide (0.776 $\mu\text{g/ml}$) (62.5%).

QS, oregano oil and probiotics are promising new herbal therapeutic agents against *Blastocystis*.

Key words: *Blastocystis*, probiotics, oregano oil, QS, LCC, LCR, TEM.

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This work was done by and for the sake of patients, May Allah alleviate their suffering and accept our honest intention to dedicate this work for the sake of their own benefit. I hope this work offers a chance for a better state of health which they deserve after their long pains and suffering.

List of Abbreviation	
AAD	Antibiotic-associated diarrhea
ACE	Angiotensin Converting Enzyme
AFT	Acid Fast Trichrome
B. hominis	Blastocystis hominis
B. ratti	Blastocystis ratti
CaCl₂	Calcium chloride
CD	Cluster of differentiation
CDAD	Clostridium difficile associated diarrhea
CDC	Centers for Disease Control and prevention
CV	Central vacuole
CW	Cyst wall
EC	Eosin-brilliant cresyl blue
ELISA	Enzyme linked immunosorbent assay
EM	Electron microscope
er	Endoplasmic reticulum
ESEM	Environmental scanning electron microscope
FL	Fibrillar layer
gly	Glycogen
GM-CSF	granulocyte-macrophage colony-stimulating factor
gr	Granules
HIV	Human immunodeficiency virus
IBS	Irritable bowel syndrome
IFA	Indirect fluorescent antibody
IgA	Immunoglobulin A

IgE	Immunoglobulin E
IgG	Immunoglobulin G
IL	Interleukin
Iron Hx	Iron hematoxylin
KCl	Potassium chloride
keV	Kilo electron volt
KH₂PO₄	Potassium di hydrogen phosphate
LAB	Lactobacillus
LCC	Living cell count
LCR	Living cell rate
LDL	Low-density lipoprotein
m	Mitochondria
MgCl₂	Magnesium chloride
MLC	Minimal lethal concentration
MLO	Mitochondrial like organelles
Na₂HPO₄	Sodium phosphate dibasic
NaCl	Sodium chloride
NaHCO₃	Sodium bicarbonate
NEC	Necrotizing enterocolitis
Nu	Nuclei
O.compactum	Origanum compactum
O.gratissimum	Origanum gratissimum
O.onites	Origanum onites
O.vulgare	Origanum vulgare
OsO₄	Osmium-tetroxide
P value	Probability value

PCR	Polymerase chain reaction
PFOR	Pyruvate ferredoxin oxido reductase
PTA	Phosphotungsten
QS	Quillaja saponaria
r.p.m	Revolutions per minute
RCT	Randomized control study
RFLP	restriction fragment length polymorphism
SC	Surface coat
SD	Standard deviation
SEM	Scanning Electron Microscope
Spp	Species
SSU-rDNA	Small sub-unit ribosomal deoxyribonucleic acid
SSUrRNA	Small subunit ribosomal ribonucleic acid
TBRI	Theodor Bilharz Research Institute
TEM	Transmission electron microscopy
Th2	T-helper 2
TMP-SMX	Trimethoprim-Sulfamethoxazole
t-test	Student test
UCT	Ultra-cut
UVR	Ultraviolet rays
V	Vacuole
WHO	World health organization

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