

# INTRODUCTION

## 1. The necessity of thesis topic

Toxocariasis belongs to the group of “*Animal disease infecting to human*”, commonly from dog. Dog ascaris has its science name is *Toxocanara canis*. Disease caused by *Toxocara canis* is called larva disease (LD) that transfer viscera in human due to trasfering of *Toxocara canis* larva. In 1952, Beaver and colleagues demonstrated presence of *Toxocara canis* larva in human and called it “*larva transfer viscera*” disease. Due to parasites without host, no growth in human so hospital literature wrote that this is “ending gate parasitic” phenomenon or “real animal disease with uncomplete”. In scope of this topic, we do not research to delimit between dog ascarid and cat ascarid so we call generally *Toxocara canis*.

At Vietnam, in recent years this disease has appeared in many places and tended rapid increase. Besides that, in Vietnam, people traditionally have habit of feeding dog without control, allowing dogs to range freely. Dog feces are met everywhere; soil samples effected egg of *Toxocara canis* changing from 5.0-26.0% depending habitat regions, so all of people has risk swallow them.

With desire to deepen knowledge to this disease aiming to high lift of diagnose quality, disease treatment, we conduct topic: “**Actual situation study, some factors has risk to infect larva of *Toxocara canis* in human and effect of treatment by Albendazole at 2 commune of An Nhon District, Binh Dinh Province (2011-2012)**”.

## 2. Object of research

1. *Assessment of actual situation infecting *Toxocara canis* in human at 2 communes Nhon Hung and Nhon Phong of An Nhon Dictrict, Binh Dinh Province.*
2. *Description of some factors leading risk effecting *Toxocara canis* larva in human.*
3. *Effective assessment of treatment by Albendazole in human, who infect *Toxocara canis* larva.*

## 3. New contributions to practice science of subject

- Actual situation research of rate infecting *Toxocara canis* larva in human; rate of infecting egg from dog and soil in environment. Defining some factors has risk infecting toxocana larva in human: contact with soil and dog every day.

- Assessment of treatment effectiveness of *Albendazole* in human who are infected with toxocara larva through clinical symptoms and tests.

#### **4. Thesis arrangement**

This thesis includes 135 pages (exempt from references, appendix), comprise into 4 chapters:

<i>Put the issue:</i>	<i>02 pages</i>
<i>Chapter 1. Overview:</i>	<i>38 pages</i>
<i>Chapter 2. Object and research method:</i>	<i>22 pages</i>
<i>Chapter 3. Research result:</i>	<i>27 pages</i>
<i>Chapter 4. Discussion:</i>	<i>42 pages</i>
<i>Conclusion:</i>	<i>03 pages</i>
<i>Proposition:</i>	<i>01 page</i>

# Chapter 1

## OVERVIEW

### 1.1. Research history of toxocariasis

#### 1.1.1. Research history of *Toxocariasis* in the world

In 1950, *Toxocara canis* larva found in patients' eyes who operated eyes due to endophthalmitis or doubt of retinal cancer. In 1952, Beaver and colleagues demonstrated presence of *Toxocara canis* in human viscera and called it "*larva transfer viscera*" disease. This case was recorded first time in children who has liver or lung syndrome; *Toxocara canis* larva is found after corpse surgery, biopsy of liver or lung. Being parasites without host that cannot grow in human body so medical literature recognized that it is phenomenon of "*ending parasites*" or "*animal disease with uncomplete*".

#### 1.1.2. Research history of *Toxocariasis* in Vietnam

Before August revolution, according to Houdemer (1938), dog in Northern infected *Toxocara canis* with 16.71%. Do Hai (1972), studying 174 haunting dogs with age of from 1-5 months in Northern, infectiveness rate was 47.1%; rate of mother dog of feeding its puppies was 73.7%, *Toxocara canis* has many in puppies from not yet open his eyes to 1 month of age, about 4-5 months of age that infectiveness rate is decrease.

In 1988, Tran Vinh Hien met a child patient (Duc Hoa, Long An) at Children's Hospital 2, Ho Chi Minh City with long-lasting fever, BCAT increase highly in blood. Serum of patient was tested by Professor Tran Van Ky in France, firming is case of *Toxocara canis* larva infectiveness. Application of ELISA technology with secretion antigen of *Toxocara canis* larva in culture medium has shown that thousands of people have positive serum with this kind of ascarid.

### 1.2. Some epidemiology characteristics of toxocariasis

#### 1.2.1. Agents cause disease, biological cycle, infectious source, receptive block of toxocariasis

##### 1.2.1.1. Agents cause toxocariasis

- Agents cause disease: Agents cause disease of *Toxocara canis* is *Toxocara canis*.

- Morphology of *Toxocara canis*: size of males 4-10 cm and females 6-18 cm. *Toxocara canis* belong to of: Branch: Nematoda, Group: Phasmida; Kind: Ascaridoidea; Race: *Toxocara*; Specied: *Toxocara canis*.

##### 1.2.1.2. Biological cycle of *Toxocara canis*

- In dog: when mother dog swallow egg getting larva of *toxocara vanis*, egg hatch in stomach and small intestine, egg release larva in period 2 then penetration into intestinal wall then following blood way go to throughout body. Around a week later, all of larva period 2 has presence in parenchyma of

liver, lung, kidney, brain. From there, larva move to windpipe, fall into esophagus to reach the stomach, and grow becoming larva in period 4 with 3 days. Around the age of 11 days to 21 days, number of adult *Toxocara canis* increase in small intestine and after 3 weeks, the eggs began to appear in puppy feces.

- In human: People infect *Toxocara canis* larva due to swallow egg that get embryo or other things that contain larva. After into digestive tract, larva separate grown egg then go to other organ by moving in body. They can travel several times to the final tissue and then make encystment, granulomas and increase eosinophils in all major organs of body, including brain and eyes.

Egg contain embryo and larva

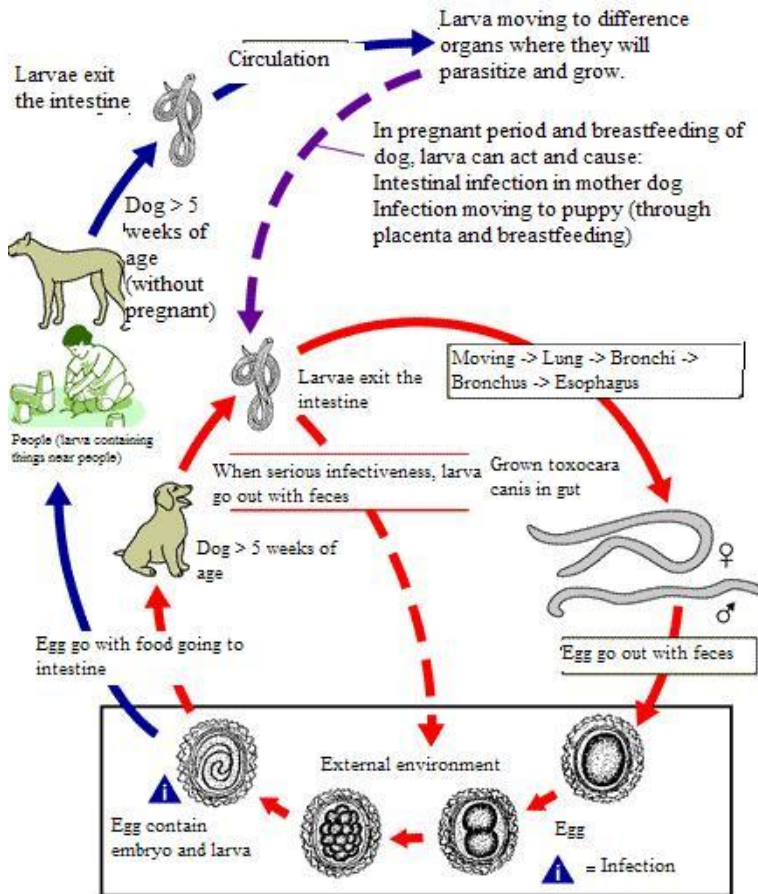


Figure 1.3. Biological cycle diagram of *Toxocara canis*  
 (Source: [www.dpd.cdc.gov/dpd.x](http://www.dpd.cdc.gov/dpd.x))

### 1.2.1.3. *Infectious source of toxocariasis*

- Contained nest: Dog is contained nest of *Toxocara canis*; contained nest of *Toxocara canis* egg is soil, water infect dog feces. Dog is main source infecting disease to human.

- Incubation period: From several weeks to several months depend at *Toxocara canis* larva infectious level of more or less and sensitiveness of patient. Larva can exist in organs on many years if without treatment.

- Infection period: Puppy is infected disease from mother dog through placentas or its mother's breastfeeding. Around 3 weeks of age, they can discard *Toxocara canis* egg to outside.

1.2.1.4. *Infectious way of Toxocara canis*: Through digestion way: Due to swallow of *Toxocara canis* egg in soil or dog feces infected water or swallow of *Toxocara canis* larva when eat undercooked dog meat. Toxocariasis does not directly infect from human to human.

1.2.1.5. *Receptive block of Toxocara canis larva disease*: Every people can infect *Toxocara canis* larva, especially children...

### 1.2.2. *Clinical characteristics of Toxocariasis in human*

Clinical characteristic of disease is very diversity, difficult to define, depending a lot in amount, parasitic position of larva and reaction of infected people's body, diagnose commonly base on immunology. Normally, patient was intended by getting general symptoms as: fatigue, loss of appetite, poor body condition with irregular fever and get allergies (*pruritus rash, urticarial rash...*). Clinical characteristics are even typical, it is very easy to confuse with other disease, often have 2 main groups: "Larva syndrome transfer viscera" and toxocariasis in eyes. Besides, it is rare to meet third group that often called "*Toxocara spp change*" disease (*convert toxocariasis*) describe all patients getting serum that is diagnosed *Toxocara canis* positive combine with some symptoms or clinical signal that get systematic or localized but not right of "larva transfer viscer" symptom or disease in eyes (*especially abdominal pain, mental defect, epilepsy, asthma, prolonged allergy*). About 25% of patients catch "*convert toxocara spp*" disease not increase BCAT, clinical symptom although reducing after treatment, they can exist long-lasting monthly or yearly.

#### 1.2.2.1. *Sort by Carles and his colleagues (1994)*

According to the clinical literature, toxocariasis clinical in adults include: respiration, nerves and muscles, digestion, hematology, system assume, other clinical manifestations: joint pain combine with fluid or not fluid in joint; hives or acne form, itching...Manifestation in eyes of adults account for 3.0% rate: uveitis, retinal particles inflammation or Chronic endophthalmitis.

#### 1.2.2.2. *Sort by Liu (1999)*

According to author Liu (1999), people infect *Toxocara canis* larva including 3 categories: visceral toxocariasis, ocular toxocariasis, and atypical toxocariasis.

#### 1.2.2.3. *Sort by Khiati and his colleagues (1992)*

Toxocariasis in children has 3 forms: form without symptom: Very common, manifested by increase BCAT in prolonged blood, higher than normal...The

common and severe form: With injuries in organs such as heart, lung, brain, eyes, muscle, maybe have many organs that mentioned above on same time.

### **1.2.3. *Toxocara canis* larva infectious situation**

#### *1.2.3.1. Geographical distribution of infectious disease caused by *Toxocara canis* larva*

Disease caused by *Toxocara canis* may appear everywhere in the world, regardless of rural or urban areas, even advanced nations that has possible infection and even more. As a result, some countries have specialist to care for the pet such as: Japan, the U.S., Australia, France, Chile, Norway... usually get high infectious rate.

#### *1.2.3.2. *Toxocara canis* larva infectious situation in the world*

Disease caused by *Toxocara canis* larva occurs in all parts of the world, regardless of urban or rural. However, several studies found that infectious rate caused by *Toxocara canis* in rural higher than urban. The tropical countries have infectious rate higher than other due to temperature and humidity suitable for the formation of egg embryos.

#### *1.2.3.3. Situation of dog roundworm larvae infection in Vietnam*

In our country, dogs are bred without control; dogs are let walk around; their feces are found everywhere; the soil samples being infected by dog roundworm vary from 5.0 – 26.0% subject to each local scene region then everybody may get the risk of swallowing their eggs.

Regarding patients having clinical manifestations and must come to hospital then the positive ratio is quite high, normally from 5.0 – 55.0%; even 60.0%. The investigation result at An Phu Hamlet (Cu Chi District, Ho Chi Minh City), a region where there are many households breeding dogs and let them walk around, shows there are 38.0% of people being infected by dog roundworm larvae.

The investigation at the community showed the dog roundworm infection result is not low.

## **1.3. Treatment and prevention against dog roundworm disease**

### *1.3.1. Immunology in dog roundworm disease*

This process is preceded as follows: there is the production increase of specific IgE and BCAT. This response is due to the fact worm larvae stimulates the immune cells: Interleukin 4 and 5 (IL4 - IL5) are created and promote lympho B to produce IgE and bone marrow to produce BCAT.

### *1.3.2. Diagnosis of disease infected by dog roundworm larvae in human*

Most of cases infected by dog roundworm larvae have no symptoms. The diagnosis of dog roundworm disease is mainly based on:

- Prehistory: having contacted directly with dogs or indirectly played with soil, thumb sucking...eating raw vegetables or fruits which are not carefully washed cooked and contained dog roundworm larvae.

- Clinical manifestation: Criteria for clinical diagnosis depend on clinical state, hurt organs.

- Paraclinical testing:

- + Blood protein electrophoresis: increase of (non-specific globulin).

- + Blood formula: there is increase or non-increase of BCAT.

+ Sedimentation blood speed: There is increase in case of systematic inflammatory response.

+ Corpuscule: larvae traces may be found in the middle of inflammatory granuloma, giant cells and fibrous tissue (rarely).

+ It is difficult or cannot find dog roundworm larvae in tissue.

+ Diagnosis through images: lesion spots may be seen at brain, liver...with suggestive nature.

+ In practicality, the diagnosis determines basing on ELISA technique with antigen of dog roundworm.

### ***1.3.3. Treatment of disease infected by dog roundworm larvae***

- State without symptom: therapy is not required even ELISA testing is positive.

-Common state: therapy is made only with specific medication such as *Albendazole*, *Thiabendazole*, *Mebendazole*, *Diethylcarbamazine* combining with *Corticoides*.

### ***1.3.4. Current medication being normally in use: Albendazole***

## **Chapter 2**

### **RESEARCH SUBJECT AND METHOD**

#### **2.1. Research subject, material, place and period**

**2.1.1. Research subject:** Selected inhabitants are from some hamlets belonging to An Nhon District, Binh Dinh Province; People infected by dog roundworm larvae are determined by ELISA technique; sample of soil and of dog feces are collected from research points.

**2.1.2. Research materials:** facilities for blood, biochemical testing, medication of dog roundworm larvae in human (*Albendazole*); chemicals, ELISA testing kits for disease infected by dog roundworm larvae (*In this research, the use of ELISA Toxocara Kits produced by USA with the sensitivity of 93%, specificity of 88% is made*); *Albendazole* medication. Samples of feces and soil are collected from research locations.

**2.1.3. Research locations:** Nhon Hung and Nhon Phong are 2 hamlets belonging to An Nhon District, BinhDinh Province; Quy Nhon Insects – Parasites – Malarias Institute.

**2.1.4. Research period:** 2011-2012

#### **2.2. Research method**

**2.2.1. Research design:** is the research type of cross-sectional description with analysis combined with interventionist research.

##### **2.2.2. Sample size and selection**

**2.2.2.1. Sample selection method:** research sample selection following systematic randomly sample selection.

##### **2.2.2.2. Sample size**

- Sample size to descriptive research: Calculated sample is n=800 people at 2 research hamlets.

- Sample size to interventionist research: in this research we select all people responding to selected criteria).

- Sample size for researching factors having risk of getting dog roundworm larvae: Investigation and testing of 50 dog feces samples; at each hamlet, 100 soil samples are tested to find eggs or dog roundworm larvae in soil; each soil sample is about 100 gram. Interview is made to all subjects from 15 years and above and subjects being under 15 years (through their guardians) on knowledge, attitudes and practices of inhabitants as regards the disease infected by dog roundworm larvae at each research point.

**2.2.3. Research content:** This research has selected 126 infected people having full research criteria to be brought into treatment interventionist research. Assessing following symptoms which remain and newly increase after 01 and 06 month therapy. Therapeutic medication: 400 mg tablet of *Albendazole*. In this research we use the specific medication: Mekozetel 400 (*400 mg Albendazole ingredients*) which is produced by Mekophar Pharmaceutical-Chemical Product Joint Stock Company of Ho Chi Minh City. Dosage:

+ Children from 5-15 years: *Albendazole* with use dosage of 10mg/kg/day/2 times (about 400 mg/day) x 21 days.

+ Adult (> 15 years): *Albendazole* with use dosage of 15 mg/kg/day/2 times (about 800mg/day) x 21 days.

This treatment regimen was researched and used by Quy Nhon Insects – Parasites – Malaras Institute in therapy. Infected people take medication after fully eating; the latter will be tracked, recorded clinical response and side effects of medication.

#### **2.2.4. Techniques applied in research**

2.2.4.1. *Information collecting tools:* investigation, interview notes for research subjects (KAP); Blood testing receipts, ELISA; feces, soil testing tools; research medical files.

2.2.4.2. *Interview, investigation techniques*

2.2.4.3. *ELISA testing technique for finding dog roundworm larvae antibody:* in this research, we use ELISA Toxocara kit set produced by USA with the sensitivity of 93%, the specificity of 88%. Some pictures show kit set produced by USA.

2.2.4.4. *Biochemical testing*

2.2.4.5. *Blood testing*

2.2.4.6. *Determining the ratio of dog roundworm infection at 2 research hamlets:* in this research, we use the feces testing technique to find egg in the sedimentation centrifugal method with Formalin ether.

2.2.4.7. *Determining the dissemination of dog roundworm egg in the surroundings:* in this research, we find dog roundworm egg in surroundings by Romanenko technique. The technique proceeds with:

**2.2.5. Indicators assessing the use in research:** The infection ratio of dog roundworm larvae in human; in dogs, in surroundings (soil)...

**2.2.6. Use definitions and concepts in research:** The infection ratio of dog roundworm larvae in human; in dogs, in surroundings (soil); Knowledge, attitudes, practices as regards disease infected by dog roundworm larvae.



**2.2.7. Errors and remedy method:** interviewed subjects have different qualifications and may not understand or sometimes they do not want to answer. Accordingly prior to interviewing, investigating and interviewing cadres must be trained and a trial interview will be made in the locality.

**2.2.8. Parameter handling:** collected parameters will be handled by statistical tests.

**2.2.9. Topic limitations:** The greatest limitation of topic is unavailable “golden criteria” for diagnosing the disease infected by dog roundworm larvae in human.

## **Chapter 3**

### **RESEARCH RESULT**

#### **3.1. REAL SITUATION OF DOG ROUNDWORM LARVAE INFECTION IN HUMAN IN NHON HUNG AND NHON PHONG HAMLETS OF AN NHON DISTRICT, BINH DINH PROVINCE**

##### **3.1.1. Some characteristics of research subjects**

Research subject group from 5 to less than 15 years is 158 people (19.8%), 15-60 year group is 480 people (60.0%), above 60 year group is 162 people (20.2%). The average age of research subject groups is  $37.6 \pm 1.4$  years. The minimum age of research subject is 5 years and the maximum one is 70 years.

The interview result made on 642 people at 2 hamlets: knowledge of inhabitants on dog roundworm: 204/642 people (31.8%) replied they knew or have heard about it; 438/642 people (68.2%) said they did not know or never heard about it. Dog roundworm infection source: 128/642 people (19.9%) believed this disease source came from dogs or cats; 25/642 people (3.9%) thought the disease source came from buffalos, cows, sheep, goats...; 489/642 people (76.2%) did not know this disease source. Dog roundworm disease transmission: 102/642 people (15.9%) believed the disease was transmitted through digestive tract; 35/642 people thought the disease was transmitted through skin system; 19/642 people believed it was transmitted from other tracts such as respiratory, blood ones...; 486/642 people did not know this disease transmission. Regarding the harmful effects of dog roundworm disease: 134/642 people (20.8%) replied this disease caused itch, nettle rash; 36/642 people (5.6%) said this caused stomachache; 36/642 replied it caused headache; 5436/642 people answered they did not know the effects of dog roundworm disease. Regarding the prevention against this disease: 148/642 opinions (23.0%) believed eating well cooked foods and drinking well boiled water were a prevention method to this disease; 199/642 opinions (31.0%) thought they should not play with soil; 244/642 (38.0%) opinions believed they should not carry dogs in their arms; 51/642 opinions (8.0%) gave other replies or did not know how to prevent this disease.

**3.1.2. Characteristics of infected people with the dog roundworm larvae at two research hamlets**

*Table 3.5. ELISA (+) testing ratio and eosinophil increase at 2 hamlets*

Hamlet	Positive ELISA		BCAT increase	
	n	Ratio (%)	n	Ratio (%)
Nhon Hung (n=400)	55/400	13.75	65/400	16.25
Nhon Phong (n=400)	71/400	17.75	77/400	19.25
<b>Total (n=800)</b>	<b>126</b>	<b>15.75</b>	<b>142</b>	<b>17.75</b>

**Remark:**

\* *Positive ELISA testing ratio:* Nhon Hung hamlet has 55 positive testing cases (13.75%), Nhon Phong hamlet has 71 positive ELISA testing cases (17.75%), at 2 research points there are 126 positive ELISA testing cases, amounting to 15.75%.

\* *BCAT increase ratio:* Nhon Hung has 65 tested cases (16.25%), Nhon Phong has 77 tested cases (19.25%), at these 2 research points there are 142 cased with BCAT increase (17.75%).

*Table 3.6. Positive serum level read by optical density (OD)*

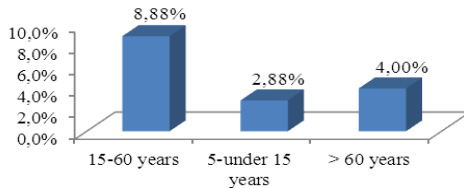
Hamlet	Number (+)	OD/Threshold		
		1 - < 1,5	1,5 - < 2	≥ 2
<b>Nhon Phong</b>	71/400	46/400	20/400	5/400
<b>Nhon Hung</b>	55/400	45/400	7/400	3/400
<b>Total</b>	<b>126/800</b>	<b>91/800</b>	<b>27/800</b>	<b>8/800</b>
<b>Ratio (%)</b>	<b>15.75</b>	<b>11.4</b>	<b>3.4</b>	<b>1.0</b>

**Remark:**

The positive serum level is mainly at low level (11.4%), the optical density (OD) level / threshold is greater or equal to 2, amounting only to 1.0%; average level (3.4%).

**3.1.3. Ratio of people infected by dog roundworm per age, sex**

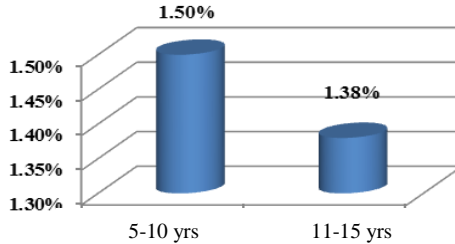
Group of people infected by dog roundworm larvae from 5 to under 15 years is 23 people (2.88%), 15-60 year group is 71 people (8.8%), above 60 year group is 32 people (4.0%). The average age of group of people infected by dog roundworm larvae is 39.5 ± 3.5 years; the minimum age is 5 years, the maximum age is 70 years.



*Figure 3.3. Ratio of people infected by dog roundworm larvae as per age group in the community*

**Remark:**

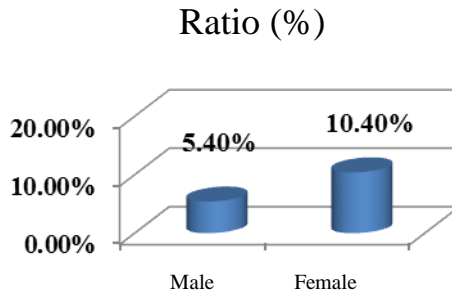
Group of people infected by dog roundworm is mainly at 15-60 age (8.88%), 5 to under15 year group (2.88%), above 60 year group (4.0%).



**Figure 3.4. Ratio of people infected by dog roundworm larvae at group from 5 to under 15 years**

**Remark:**

The ratio of people infected by dog roundworm larvae in human at group from 5 to under 15 years: from 5-10 years is 12/800 cases, amounting to 1.5%; from 11-15 year group is 11/800 cases, amounting to 1.38%.



**Figure 3.5. Ratio of group infected by dog roundworm larvae as per sex**

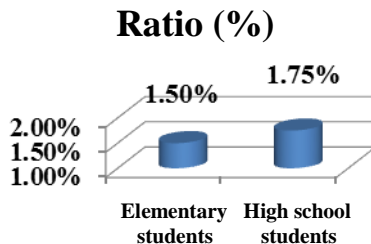
**Remark:** In the group of people being infected by dog roundworm larvae in community: masculine sex has 43/800 people being infected by larvae (5.4%), feminine sex has 83/800 people being infected by larvae (10.4%).

**3.1.4. Distribution of people being infected by dog roundworm larvae as per profession, educational qualification**

People being infected by dog roundworm larvae in our research subject group at two hamlets are mainly farmers with 68/800 people (8.5%); pupils with 26/800 people (3.25%); cadres, officials with 15/800 people (1.87%); other professions with 17/800 people (2.1%). The difference between different profession groups: Cadres/officials, farmers, pupils and other professions with the infection ratio having statistical significance with  $p < 0.05$ .

People being infected by dog roundworm larvae in the research subject group are mainly in the group of qualification from middle ranking to downwards are 109/800 people (13.625%), group having college, graduate and post graduate amounting to a low ration with 17/800 people (2.125%),

especially at two hamlets there are 2 people of post graduate qualification. The difference of educational qualification comparing to the infected ratio has no statistical significance with  $p > 0.05$ .



**Figure 3.6. Ratio of people infected by dog roundworm in student groups**

**Remark:** The ratio of people infected by dog roundworm larvae in student groups: elementary students (5-10 years) have 12/800 cases amounting to 1.5%; high school students (11-18 years) have 14/800 cases amounting to 1.75%.

### 3.1.5. Some research results of clinical, paraclinical characteristics

In 126 people being infected by larvae which are screened in community: there are 47/126 people having itch symptom (37.3%), 6/126 people having nettle rash symptom (4.8%), 24/126 people having body ache (19.1%), 8/126 people getting stomachache (6.3%), 11/126 people getting headache (8.7%), 5/126 people having fever (3.9%), 8/126 people having digestive disorder (6.4%), 17/126 people having other symptom such as bone joints ache ... (13.5%). According to our research results, the most met clinical symptom is itch (36.5%), body ache (19.0%), headache (8.7%), stomachache, digestive problems (6.3%), nettle rash (4.7%), fever (3.9%). According to research result, after testing 800 people in two hamlet community, there are 167 people getting leucocyte increase, 142 people getting BCAT increase, 126 people getting positive ELISA testing (15.75%), the ratio of people with normal ELISA (+) testing / BCAT is 126/658 (19.14%). The level of BCAT increase in 126 people being infected by larvae is 24/126 people with light increase (19.0%), 53/126 people with medium increase (42.0%), 49/126 people with high BCAT increase level (39.0%).

## 3.2. SOME FACTORS HAVING RISK OF DOG ROUNDWORM LARVAE INFECTION IN HUMAN

Through interviewing 800 people, there are 239 people which have the habit of eating raw vegetables (26.5%), 134/800 people having habit of drinking non-boiled water (16.8%). Regarding people who have the habit of eating raw vegetables, drinking non-boiled water, there are only 5 people with positive ELISA testing result. Through statistical analysis, we see no relationship between eating raw vegetable and drinking non-boiled water and the infection ratio of dog roundworm larvae ratio ( $p > 0.05$ ).

**Table 3.17. Relationship between the habit of playing with soil, contacting soil and dog carrying and the infection ratio of dog roundworm larvae in human**

Investigated people number	Dog roundworm larvae infection ratio (%)	Soil playing, contacting		Dog carrying	
		Number	Ratio (%)	Number	Ratio (%)
800	15.75	119	14.9	94	11.8
<b>p</b>	< 0.05				

**Remark:** Through interviewing 800 people, there are 119/800 people having habit of soil contacting (14.9%); 94/800 people having habit of dog carrying (11.8%). In the group of people having habit of soil contacting, dog carrying, there are 98 ones being infected by dog roundworm larvae. Through statistical analysis, we see there is a relationship between soil contact, dog carrying and the ratio of people being infected with the dog roundworm larvae ( $p < 0.05$ ).

**Table 3.18. Relationship between soil contact and dog roundworm larvae infection in human**

Soil contact	Infected	Non infected	OR p
Regular	41	63	OR=3.5
Irregular	95	511	< 0.05

**Remark:** There is a difference between soil play - soil contact and dog roundworm larvae infection in human at research points ( $p < 0.05$ ). The risk of being infected by dog roundworm in people who play and contact soil is 3.5 times higher than those who do not play or contact soil.

**Table 3.19. Relationship between dog carrying and dog roundworm larvae infection in human**

Dog carrying	Infected	Non infected	OR p
Regular	28	67	OR=1.6
Irregular	98	367	< 0.05

**Remark:** It exists a difference between dog carrying and infection of dog roundworm larvae in human at research points ( $p < 0.05$ ). The risk of getting infection from dog roundworm larvae in people carrying dog is 1.6 time higher than those who do not carry dogs.

**Table 3.20. Relationship between ratio of soil infected by dog roundworm egg infection and the ratio of dog roundworm larvae infection in human**

Subject infected by egg/larvae	Infection situation		OR p
	Infected	Non infected	
Egg infected soil	51	149	OR=1.8
Larvae infected people	126	674	< 0.05

**Remark:** There is a difference between soil being infected by dog roundworm larvae and the ratio of people being infected by dog roundworm larvae ( $p < 0.05$ ). The risk of being infected by dog roundworm in human living in soil infected by dog roundworm egg is 1.8 time higher than that being not infected by dog roundworm larvae.

### 3.2.3. Dissemination of dog roundworm egg in the surroundings

The infection ratio of dog roundworm egg in soil at Nhon Phong and Nhon Hung hamlets has a difference ( $p < 0.05$ ): in households which breed dogs (41.9%) and in those which do not breed dogs (13.1%). The risk of soil samples being infected with dog roundworm eggs in households breeding dogs is 4.7 times higher than in those which do not breed dogs ( $p < 0.05$ ).

The common infection density of dog roundworm eggs at two hamlets is 5.2 eggs/100 gram of soil, in which in households breeding dogs is from 5.6 – 7.3 eggs/100 gram of soil, in households which do not breed dogs is from 0.9 – 2.1 eggs/100 gram of soil.

**Table 3.24. Relationship between dog roundworm larvae infection in human and in dog breeding**

Dog breeding household	Infected people number	Non infected people number	OR p
Breeding	77	265	OR=1.8 < 0.05
Non breeding	49	309	

**Remark:** There is a difference between dog breeding and infection with dog roundworm larvae at research points ( $p < 0.05$ ). The infection risk of dog roundworm larvae in human in households which breed dogs is 1.8 time higher than those living in households which do not breed dogs.

### 3.2.4. Ratio of dog roundworm infection in dog at community

Through the feces analysis of 100 soil samples at 2 research points, the common infection ratio of dog roundworm larvae at 2 points is 43.0%. There is no difference between the ratio of infected dogs and dog breeding at research points.

## 3.3. TREATMENT EFFICIENCY OF ALBENDAZOLE

### 3.3.1. Disease treatment efficiency assessment due to dog roundworm larvae by Albendazole

**Table 3.26. Tracking clinical symptom of people infected at two hamlets prior and after one month treatment**

Clinical symptoms	Assessment period		Ratio (%) of existing symptoms
	Prior treatment	After 1 month treatment	
Itch	47	5	10.6
Nettle rash	6	1	16.67
Body ache	24	0	0
Stomachache	8	2	25.0
Headache	11	0	0
Fever	5	0	0
Digestive disorder	8	1	12.5
Other symptoms	17	2	11.8

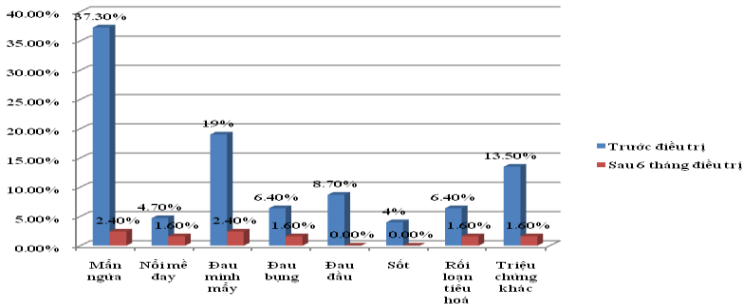
**Remark:**

After 1 month treatment, almost all clinical symptoms of 126 people being infected are reduced: 42/47 infected people do not get itch (10.6% still get it); 5/6 infected people do not get nettle rash (16.67% still get it); 6/8 infected people do not get stomachache (25.0% still get it); 7/8 infected people do not get digestive problems (12.5% still get it). No infected people get ache to body, head and fever.

After 1 month treatment, over 126 infected people at 2 research points show following results: Clinical symptoms with ratio reduce obviously: Itch (37.3% - 4%), nettle rash (4.7% - 0.8%), body ache (19% - 0), stomachache (6.4% -

1.6%), headache (8.7% - 0), fever (4% - 0), digestive disorder (6.4% - 0.8%), other symptoms (13.5% -1.6%).

After 6 month treatment, 44/47 infected people do not have itchy symptoms (6.4% still get it); 4/6 infected people do not have nettle rash (33.3% still get it); 21/24 infected ones do not have body ache (12.5% still get it); 6/8 infected people do not get stomachache (25.0% still get it); 6/8 infected ones do not get digestive problems (25.0% still get it); headache and fever do not affect people. The change in clinical symptoms has a statistical significance with  $p < 0.05$ .



- nettle rash: nổi mề đay
- headache: đau đầu
- itch: mẩn ngứa
- fever: sốt
- digestive problems: rối loạn tiêu hóa
- body ache: đau mình mẩy
- stomachache: đau bụng
- others: triệu chứng khác

*Prior treatment*  
*After 6 month treatment*

**Figure 3.9. Comparison of clinical symptoms prior and after 6 month treatment**

**Remark:** Through this diagram, we can see after 6 month treatment, the clinical symptoms in infected people are reduced significantly: Itch (37.3% - 2.4%), nettle rash (4.7% -1.6%), body ache (19.0% - 2.4%), stomachache (6.4% - 1.6%), headache (8.7% - 0), fever (4.0% - 0), digestive problems (6.4% - 1.6%), other symptoms (13.5% - 1.6%).

Regarding paraclinical symptoms: after 1 month treatment: 3/126 infected people have a leucocyte increase (2.4%); 5/126 infected people have BCAT increase (4.0%); 121/126 infected people with BCAT infection being reduced to normal level (96.0%). After 6 month treatment: 2/126 infected people have leucocyte increase (1.6%); 5/126 infected people have BCAT increase (4.0%); 5/126 infected people get ELISA (+) test (4.0%) and 121/126 infected people get ELISA (-) test (96.0%). The change in BCAT and ELISA testing indicators prior and after treatment has a statistical significance with  $p < 0.05$ .

### **3.3.2. Assessment of unexpected effect of *Albendazole***

Regarding functional systems provided by the infected, there was 12/126 patients showing colic or digestive disorder (9.6%); 4/126 patients showing headache (3.2%); 5/126 patients showing fever (4.0%); no patients showing alopecia and 8/126 patients showing other symptoms (6.4%) such as body pain, anorexia, tiredness.

After one month of treatment using *Albendazole* 400 mg with dosage of 800mg/day/2 times after meal, it is found that 7/126 patients showed epigastria pain or digestive disorder (5.6%); 5/126 patients showed headache (4.0%); 3/126 patients showed fever (2.4%); 3/126 patients showed alopecia without reason (2.4%); 8/126 patients showed other symptoms such as losing weight, anorexia. In two study places, there was 5/126 patients suffering liver disorder (3.9%) and no patients suffering kidney disease.

## **Chapter 4 DISCUSSION**

### **4.1. PLACES AND SUBJECTS OF THE STUDY**

#### **4.1.1. Geographical location and economic and social environment of study place**

In Binh Dinh in particular and the regions of Central Vietnam – Central Highland in general, it is hot and wet with low annual rainfall, poor economics and underdeveloped society. People's intellectual standard in the regions is still low. Their occupation is often husbandry which makes them regularly exposes to ground and adopt dog in their house. Their custom and habit is too often eating uncooked vegetable and exposing to dog. This explains why morbidity rate of parasite is very high in the Central Vietnam and the Highland Central with the highest rates in the whole country. In the regions' environment, larvae survive and develop strongly.

#### **4.1.2. Study subject**

\* **Age of study subjects:** Our group of study subjects was in age of 5-70, in which a group of 158 people (19.8%) was from 5 to under 15 year old, a group of 480 people (60.0%) was from 15 to 60 year old and a group of 162 people (20.2%) was over 60 year old. It was mainly focused on the group of subjects of 15 – 60 year old (60.0%). The group of 5 to under 15 years old and the group of over 60 year old had nearly equal ratios (19.8% & 20.2%). Average age of all subjects was  $37.63 \pm 1.37$ .

\* **Genders of study subjects:** Due to random selection of subjects in households in which man went to other places for job, woman accounted for majority in all study subjects. There were 243/800 male (30.4%) and 557/800 female (69.6%). This selection was similar in 2 communes.



## **4.2. MORIBIDITY RATE OF LARVAE OF *Toxocara canis***

According to Duong Van Tham (2013), morbidity rate of larvae of *Toxocara canis* in all study subjects was 67.1% which is much higher than that in Denmark (2.4%), US (14%), Brazil (26.8%) or some Western countries (14.2-37%) [28]. However, in comparison to tropical countries, the result is consistent with the morbidity rate in Bali (63.2%) and lower than that in Saint Lucia (86.0%). Infection of larvae of *Toxocara canis* is ranked second in many infections transferred by ground in the poor in US and often ignored when being diagnosed and screened by Hotez P.J, Brooker and Simon. Seropositivity rate of *Toxocara canis* has been examined in some continents. In particular, in Europe, seropositivity rate was 1.0 % in Spain, 13.65% in Slovak Republic; in Oceania, seropositivity rate was  $0.70 \pm 1.65\%$  (New Zealand), 7.0% (Australia); in South America, seropositivity rate was 10.6- 38.9% (Argentina) and 46.3 % in Northeast of Brazil. Infection of *Toxocara canis* also occurred in population in rural areas and tropical forests in South America and South East Asia. This rate was 57.5% in Northeast of Taiwan and 19% in Liban. In Middle East, a dry subtropical area, seropositivity rate was lower. Morbidity rate of larvae of *Toxocara canis* in children in urban areas was lower than children in rural areas (1.6% against 4.4%).

### **4.2.1. Morbidity rate of larvae of *Toxocara canis* in two studied communes**

In two study communes, there were 126/800 cases of infection of *Toxocara canis*, accounting for 15.75%.

Our study result has showed a lower morbidity rate against study result of Hoang Dinh Dong in Ho Chi Minh City of 20%. According to Paludo, morbidity rate of larvae of *Toxocara canis* was 28.8%, mainly in children of from 7 months to 5 year old ( $p=0.0016$ ). According to Cristiane M. Colli, morbidity rate of larvae of *Toxocara canis* in human was 51.6%. In Korea, seropositivity rate of larvae of *Toxocara canis* in adult in rural areas was 5%.

### **4.2.2. Age of subject group to be infected larvae of dog roundworm (*Toxocara canis*)**

The study result has been consistent with other studies, but according to Nguyen Van Chuong et al there were no difference between morbidity rate on children and morbidity rate on adults. According to Le Tran Anh and et al, in his study survey on 47 patients in Hospital 103, the average age of subject group was  $32.66 \pm 13.86$  and most patients were 20-50 year old (74.47%). There were only 2 patients of children under 10 year old (4.3%).

This result is similar with that of SD Fernando et al (2007), seropositivity rate with larvae of *Toxocara canis* was 20.0%; study result of Iddawela DR et al (2003) has indicated a seropositivity rates with larvae of *Toxocara canis* of 91.0%. Our study result on the same age group (5 – 15 year old) has showed a higher morbidity rate than that of Sviben M et al (2009) and showed particularly the morbidity rate of male children in 11-14 year old (42.9%) and

of female children in 7-10 year old (44.2%). According to Chia-Kwung Fan (2004), there were 43.9 - 47.5% patients in 30-59 year old and 51.5% patients of over 60 year old. According to Mohammad Zibaei (2013), patients were in age of 14-29 and average age was  $19.8 \pm 11.42$ .

Study result of Judith Fillaux et al (2007), rates of patient age group were 2-10 years (42.1%), 11-24 years (21.7%), 25-49 years (40.0%), 50-79 years (13.6%).

#### **4.2.3. Morbidity rate of larvae of *Toxocara canis* on human by genders**

In this study, there was difference in seropositivity rates with *Toxocara canis* in man and woman in which the seropositivity rates in woman was double compared with man. However, the number of woman also was double compared with the number of man in the study group (Male: 243, female: 557) and hence this difference is not statistically significant. This result is also consistent with study result of Le Kieu Anh in Hospital 103 which has released that the morbidity rates were 44.68% in male and 55.32% in female. This difference has been blamed for chronic urticaria which primarily contacted by female and according to some authors approximately 75% chronic urticaria patients was female. According to study result of Nguyen Van Chuong et al on situation of infection caused by *Toxocara canis* in some places in Quang Nam Province and Quang Ngai Province (2011), seropositivity rates with *Toxocara canis* in the 02 Communes of Dien An Commune and Duy Trinh Commune, Quang Nam Province and in Nghia Trung Commune and Duc Phuong Commune, Quang Ngai Province had no disparity between male and female with seropositivity rate in male (6.52 – 16.67%) and female (5.84 – 16.44%).

#### **4.2.4. Morbidity rate of larvae of *Toxocara canis* on human by education and occupation**

This infection contacts pupils, students and college or university degree owners. Its distribution is quite equal in all occupations. However, it could be seen that farmers (36.17%), students (27.66%) are likely to be infected much more than other occupations (polices, workers, sellers, office workers...). This disease spreads in all from people with high school education to people with college or university education. This distribution represents the association of morbidity rate of larvae of *Toxocara canis* and chronic urticaria. Infection of larvae of *Toxocara canis* often is associated with socio-economic environment and residential places (rural or urban areas). Accordingly, occupations that often work with soil such as famers have a higher morbidity rate. However, there are no disparity in current morbidity rates of chronic urticaria in education, ethnic, occupation and income. Morbidity rate of larvae of *Toxocara canis* in rural areas is higher than that in urban areas (4.4% against 1.6%).

The study of Kaplan and et al has represented 2.6 % healthy people having *Toxocara canis* seropositivity in Elazığ, an urban area of Turkey. Another study has released that 6.0 % of students in Veterinary Schools and 10.0% in dogs contactors show a *Toxocara canis* seropositivity. There was

no significant difference in morbidity rates in distribution of population, ages, genders, occupation, living environments and pet owners.

### **4.3. RISK FACTORS FOR *Toxocara canis* INFECTION IN HUMAN**

#### **4.3.1. Knowledge and attitude of prevention of *Toxocara canis* in human**

In this study scope, we have interviewed 800 study subjects of which 158 subjects have been interviewed through baby sitters. Hence, the real subjects participated into the interview was 642 people. The study result is also consistent with suggestion of Fahrion AS to limit dog adoption in the community to decrease the prevalence of toxocariasis in human.

#### **4.3.2. Risk factors of habits and life styles**

According to Hoang Dinh Dong, infection of larvae of *Toxocara canis* is due to wrong method of washing hand and not regularly washing hand before meal.

The study of Maria-Carmen Turrientes (2011) has indicated the obvious association of family history of allergies and chronic urticaria. It is possible that this subject group suffered either chronic urticaria or infection of *Toxocara canis* larvae and this factor is mainly associated with environmental factors than family factors. There are 21.3% of subjects that had their family suffered the same infections possibly caused by eating and living together. There was no disparity in morbidity rates in male and female. Children living in urban areas had lower morbidity rates compared with children in rural areas whose parents and guardians worked in fields and had low education, poor economic condition. These children suffered risk factors of exposing to dog (72.2%), playing with dirt and keeping toys in their mouth (36.0%) and having habit of eating fresh vegetable (26.0%) [30].

According to P.A.M. Overgaauw and et al (1997), no increase of morbidity rate of larvae of *Toxocara canis* in those working in veterinary hospital, cleaners for breeding facilities or cat owners. The possible reason is good personal hygiene. According to Maria-Carmen Turrientes (2011), there was no disparity in morbidity rates of urticaria for those with pet in their home and those not. Infection caused by larvae of *Toxocara canis* has been known to be caused by transferring the larvae from animal to dirt and by habit of “eating dirt” of those especially children living in households with pet not being wormed. However, ratio of regularly exposing to dirt in the study was only 34.04% and hence the author needs to focus other sources of infection such as eating fresh and uncooked vegetable and meat.

According to Elaine Cristina Negri (2013), it is recommended to promote reserve public health activities also for healthy people and to especially focus on worming pet to avoid larvae contamination on ground and to educate people developing healthy lifestyle.

#### **4.3.3. Association of playing and exposing to dirt and infection of *Toxocara canis* larvae in human**

There is difference between association of playing with and exposing to dirt and infection of *Toxocara canis* larvae in different times of study ( $p < 0.05$ ). Risk of *Toxocara canis* infection for those playing with and exposing to dirt is 3.5 times higher than those not playing with and exposing to dog. There is disparity between dirt containing larvae of *Toxocara canis* and morbidity rate of *Toxocara canis* ( $p < 0.05$ ). Risk of *Toxocara canis* infection for those living in ground containing larvae of *Toxocara canis* is 1.8 times higher than those living on ground not containing larvae of *Toxocara canis*.

In a study of morbidity rates of larvae of *Toxocara canis* in public play grounds in areas of Dublin, Ireland (O'Lorcain P and et al., 2011); the result has examined total 9 play grounds in cities and counties in Dublin which provided 228 samples. In these samples, 15% was seropositivity of larvae of *Toxocara canis* and the average density was 1.4 eggs per 100 g. Two play grounds that were found to contaminate higher density of larvae of *Toxocara canis* against traditional play grounds were play grounds containing many wooden and metal tools. There was no statistically significant in seropositivity samples collected from all in and out of play grounds and no evidence of toxocara leonina (cat roundworm) here. Only one sample showed seropositivity of larvae of *Toxascaris leonina*. More than 50.0 % of seropositivity of larvae of *Toxocara canis* was found. A test in this study has represented that moisture of ground has contributed to lengthening life of larvae of *Toxocara canis* in environment. A recovery rate of 69.8% has been showed by innovated floating method. Rate of infection of larvae of *Toxocara canis* from ground was 8.7 % so that ground become a risk factor of infection of *Toxocara canis* in human ( $p = 0.0178$ , 95%, CI=1.244-9.995).

#### **4.3.4. Association of dog owners and those exposing to dog with the morbidity**

There is difference between association of exposing to dog and infection of *Toxocara canis* larvae in different times of study ( $p < 0.05$ ). Risk of *Toxocara canis* infection for those exposing to dog was 1.6 times higher than those not exposing dog. According to Do Thi Le Thuy, it is recommended to eliminate source of infection by worming dogs timely. Especially, puppies of fewer than 4 – 6 months should be provided treatment because they are easy to be infected and regularly expose to human.

#### **4.3.5. For the possibility of distribution of *Toxocara canis* eggs out of the environment**

Authors from National University of La Plata, Argentina (Chiodo P and CS., 2006) implemented a study on factors related to *Toxocara canis* in humans in the population at the rural Argentina in order to assess the relation between the infection of *Toxocara canis* larvae and the situations as well as

demographic, environmental, hygienic variables, eosinophilia and intestinal parasite in that population. They conducted serologica tests on 100 individuals by ELISA Techniques to detect antibodies against *Toxocara canis* antigen. The eosinophil increase in peripheral blood, the intestinal parasite presence and environmental, demographic, cultural and social data were estimated. 81 samples of dog feces were estimated depending on research individual to detect *Toxocara canis* eggs. The soil samples around houses (n = 47) and from public parks (n = 4) were taken. In order to determine the relation, Fisher tests were calculated. The results indicated that seropositive rate was 23.0%. The eosinophil increase in peripheral blood was detected in 86.95% of individuals having seropositive and in 37.66% individuals having seronegative ( $p < 0.001$ , OR = 11.03). Among 23 individuals having seropositive, there were 69.5% having at least one type of intestinal parasite. All individuals having seropositive had dogs in their houses. There was a significant relation between the appearances of antibodies against *Toxocara canis* among the dog owners. *Toxocara canis* eggs were detected in feces of 5/81 dogs and 3 of them belong to individuals have seropositive. *Toxocara canis* eggs were found in 41.17% soil samples, 8 of which were taken around houses of individuals having seropositive ( $p = 0.032$ ; OR = 4.36). Analyzing all variables having influences on prevalence rates of larvae in this population may establish public health programs, particularly focusing on treating parasitic diseases in dogs.

#### **4.4. FOR PROPOSTION OF PEOPLE INTECTED LARVAE BY CLINICAL SYMPTOMS AND PARACLINICAL SYMPTOMS**

##### **4.4.1. Several clinical characteristics**

Tran Thi Hong proposed that *Toxocara canis* larvae in organ caused clinical symptoms as follows: Hepatomegaly (74.6%), fever (69.3%), respiratory indicators (66.7%), gastrointestinal indicators (47.6%), tiredness (44.8%), malnutrition (44.2%), and splenomegaly often coupled with hepatomegaly (32.9%), loss of appetite (31.1%), haggardness (26.2%), cardiovascular indicator (11.1%), and edema (11%).

According to Iddawela DR (2003), clinical symptoms caused by *Toxocara canis* are abdominal pain (45.0%), cough (30.0%), body ache (23.0%), urticaria (20.0%). Munoz-Guzman MA (2010) stated that 30.8% of children infected *Toxocara canis* larvae exhibited asthma symptoms, 19.7% of children infected *Toxocara canis* larvae did not have asthma symptoms. The research results of Wisniewska-Ligier M were 35.0% children having recurrent abdominal pain, 18.4% getting headache, 5.8% losing appetite, and 22.3% presenting symptoms of allergies. Children from the age of 4 to 11 infected *Toxocara canis* had wheezing indicators (22.4%). Graziella Quattrocchi *et al.* (2012) indicated that there was a relation between epilepsy and prevalence of *Toxocara canis* larvae in humans.

##### **4.4.2. For paraclinical tests**

According to the report estimating helminth control activities in the period from 2006 to 2010 of Institute of Malariaology Parasitology and Entomology Quy Nhon (2009), in 2009, there were 4,640/12,134 positive ELISA tests (38.24%); on 2010, there were 13,112/42,092 positive ELISA tests (31.15%). This proportion has been higher in our study. However, the proportion of patient infected *Toxocara canis* larvae visited 30/4 Hospital (2011-2012) was lower than out research result (4.6-8.0%). The proportion of patient infected *Toxocara canis* larvae has been the highest in cao nhất tại Hospital for Tropical Diseases in Ho Chi Minh City (2001-2003).

#### **4.6. THE TREATMENT EFFECTS OF ALBENDAZOLE ON DISEASES CAUSED BY *Toxocara canis* LARVAE INFECTION IN HUMANS**

##### **4.6.1. For improvement of paraclinical symptoms**

Do Thi Le Thuy determined that although clinical manifestations of the diseases were typical, it was easy to mistake them to those of other diseases. Besides, the treatments requires a long time and many efforts of patients and doctors because clinical symptoms of the disease can decrease after treatment yet lasting months or even years. Luong Truong Son *et al.* (2013) suggested that treating *Toxocara canis* larvae using Albendazole had high effectiveness. After treatment, the manifestations of itching and urticaria decrease significantly. Particularly, after treated, patients feel they are eating and sleeping better. According to Huynh Hong Quang, at present, there are many typed of drug effective for disease caused by *Toxocara canis* larvae on the market, but each type has its own mechanism of action and certain side effects. Most of drug therapies are long-term and it is hard to avoid discomfortable signs, particularly digestive disorders. Recently, Albendazole has shown effectiveness on cases of *Toxocara canis* infection when used with high dose of 800 mg/day in 2 or 3 weeks. Azira NMS proposed treatment of ocular Toxocariasis needed aggressive anti-inflammatory treatment, combining with using Albendazole 800 mg/day for adult and 400 mg/day for children from 2 to 4 weeks. Albendazole is capable of going through the blood-brain barrier and destroying *Toxocara canis* eggs in the tissues.

##### **4.6.2. For improvement of paraclinical symptoms**

Luong Truong Son implied that 100% of eosinophilia rate after treatment returned to the normal range, 88% of those patients having seronegative for *Toxocara canis* larvae. Gregory Helsen *et al.* (2011) suggested to treat *Toxocara canis* in humans with the dose of 400 mg Albendazole twice a day (average weight of patient is 80 kg) and 60 mg Prednisolone in five days. This treatment dose eliminated the symptoms of itching and urticaria in one day. After a 21-day therapy, he realized clinical symptoms have no recurrence in 2 years.

##### **4.6.3. For undesired effects of Albendazole**

According to several studies on undesired effects of after long-term treatment, there have been about 2.2% of patients exhibiting hair loss and recovering after that. In our study of using drugs to treat 126 patients, after 3 days, there were 03 patients showing the sign of hair loss, accounting for 2.3%. The result is also consistent with other studies as well as recommendations for undesired effects of the drug.

## CONCLUSIONS

### 1. THE ACTUAL STATE OF *Toxocara canis* LARVAE INFECTION IN HUMANS AT 02 COMMUNES OF NHON HUNG AND NHON PHONG, AN NHON DISTRICT, BINH DINH PROVINCE

- General prevalence in the two research sites has been 15.75%, in which in Nhon Hung Commune has been 13.75%, Nhon Phong Commune 17.75%. ELISA rate (+) has been 15.75%; increase eosinophil rate has been 17.75%.

- The age of group infected *Toxocara canis* larvae: average age has been  $39.5 \pm 3.5$  tuôi, the youngest has been 5, the oldest has been 70. The age group infected *Toxocara canis* larvae has been mainly from 15 to 60 (8.88%); 5-10 (1.5%); 11-15 (1.38%); over 60 (4.0%).

- The prevalence of *Toxocara canis* larvae by sex: In the total survey, male was 5.4%, female 10.4%; in total infected, male has been 34.13%, female 65.87%.

- The prevalence of *Toxocara canis* larvae by occupation: agriculturalists and students accounted for high rates; agriculturalist has been 8.5%, students 3.25%.

- There has been no difference of the prevalence of *Toxocara canis* larvae in people with different qualifications.

### 2. SEVERAL RISK FACTORS OF *Toxocara canis* LARVAE INFECTION IN HUMANS

- There has been no relation between eating raw vegetables and drinking unboiled water and the prevalence of *Toxocara canis* larvae in research sites.

- The relation between playing in the dirt, exposing to soil and the prevalence of *Toxocara canis* larvae in humans: The risk of the prevalence of *Toxocara canis* larvae in people playing in the dirt and exposing to soil has been 3.5 times higher than that in people not playing in the dirt and/or exposing to soil ( $p < 0.05$ ). The risk of the prevalence of *Toxocara canis* larvae in people living on the soil infected *Toxocara canis* eggs has been 1.8 times higher than that in people not living on the uninfected soil.

- The relation between owning dog or exposing to dog and the prevalence: The risk of the prevalence of *Toxocara canis* larvae in people exposing to dog has been 1.6 times higher than that in people not doing this ( $p < 0.05$ ).

- The possibility of distribution of *Toxocara canis* eggs out of the environment:

+ *The prevalence of Toxocara canis eggs in soil of research sites:* In households owning dog the rate has been 41.9%, in households not owning dog the rate has been 13.1%. The risk of the infection of *Toxocara canis* eggs in soil at households owning dog has been 4.7 times higher than that in households not owning dog. The risk of the prevalence of *Toxocara canis* larvae in people at household owning dog has been 1.8 times higher than that in people at households not owning dog ( $p < 0.05$ ).

+ *The density of Toxocara canis eggs infection in soil of research sites:* The general density of *Toxocara canis* eggs infection in the two communes has been 5.2 eggs/100 g soil, in which at households owning dog from 5.6 to 7.3 eggs/100 g soil, at households not owning dog from 0.9 to 2.1 eggs/100 g soil.

### **3. THE TREATMENT EFFECTS OF ALBENDAZOLE ON PEOPLE INFECTED *Toxocara canis* LARVAE**

The Albendazole dose of 10 mg/kg/day (about 400 mg/day) within 21 days for children (from 5 to 15 years old) and 15 mg/kg/day (about 800 mg/day) within 21 days for adult (>15 years old):

#### **\* After a month treatment:**

- *Clinical symptoms*: Rashes: 37.3-4%; urticaria: 4.7-0.8%; body aches: 19-0%; abdominal pain: 6.4-1.6%; headache: 8.7-0%; fever: 4-0%; digestive disorders: 6.4-0.8%; others: 13.5-1.6% ( $p<0.05$ ).

- *Paraclinical symptoms*: Leukocytosis: 2.4%; increase: 4.0; eosinophil reaching normal limits: 96.0% ( $p<0.05$ ).

#### **\* After six-month treatment:**

- *Clinical symptoms*: Rashes: 37.3-2.4%; urticaria: 4.7-1.6%; body aches: 19,0-2.4%; abdominal pain: 6,4-1.6%; headache: 8,7-0%; fever: 4,0-0%; digestive disorders: 6,4-1.6%); others:13,5-1.6%. After treatment, clinical symptoms in patients decreased significantly ( $p<0.05$ ).

- *Paraclinical symptoms*: Leukocytosis: 1.6%; eosinophil increase: 4.0%; ELISA tests (+): 4.0%; ELISA tests (-): 96.0% ( $p<0.05$ ).

Using Albendazole in treatment of *Toxocara canis* larvae infection in humans has been raetive safe:

- *Liver, fidney functions*: After a month treatment, 3.9% infections have had liver dysfunction; none has had kidney dysfunction.

- *Clinical manifestations*: Epigastric abdominal pain or digestive disorders: 5.6%; headache: 4.0%; fever: 2.4%; unexplained hair loss: 2.4%; 63% infections have had other symptoms such as weight loss, eating less, etc.

### **RECOMMENDATIONS**

1. Implementing propaganda for the public about the ways of preventing diseases caused by *Toxocara canis* larvae infection such as restricting owning dog, not exposing to dog, particularly children, washing hands before eating, using labor protection means like boots, gloves, etc. when working and directly exposing to soil, deworming periodically for dog in order to restrict risk.

2. Researching in a more long-term assessment about the treatment effects of Albendazole on diseases caused by *Toxocara canis* larvae infection in humans, particularly reinfection phenomenon.

3. Conducting next research on the age group under 5 and species identification (*Toxocara canis*, *Toxocara cati*).