

# **Epidemiology Bulletin**

– Content –

Survey of *Entamoeba Histolytica*  
in Taitung County

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## Survey of *Entamoeba Histolytica* in Taitung County

### I. Introduction

*Entamoeba histolytica* is a monocellular organism. It exists primarily in tropical and sub-tropical areas of poorer sanitary and personal hygiene conditions and lower social-economic conditions. The protozoa live in the large intestines of men to cause amoebic dysentery, perforation of intestines, and by penetrating through intestinal walls into blood-streams or lymphatic circulations, to produce abscess of liver, lung or brain, or ulceration of skin.<sup>(1)</sup> WHO report (1979) shows that around 400 million population were infected by *Entamoeba histolytica* each year, though only 1.5 million had clinical disease. Amoebic dysentery thus seems to be a disease of high prevalence but low morbidity and fatality rates.<sup>(2,3)</sup>

*Entamoeba histolytica* appears in two forms: trophozoite of 10-40  $\mu\text{m}$  in size, of no definite form, with clear and movable outer fluid and devoured red blood cells in the inner fluid; and cyst of 5-15  $\mu\text{m}$ , of oval shape. Cysts come in mononuclear, binuclear and quadrinuclear forms. The last one is the mature cyst of communicability.<sup>(4,5)</sup>

Clinical symptoms vary from the sites and degrees of infection. Initial symptoms are diarrhea, nausea, vomiting and fever. Symptoms in the acute stage are serious abdominal pain, severe diarrhea with profuse blood and mucus, dehydration and prostration. Symptoms in the chronic stage are intermittent diarrhea, tiredness and loss of weight. Trophozoites can be identified in the feces of acute patients, and cysts in the feces of chronic patients. Symptoms vary with the physical conditions and immune reactions of hosts, and the strains of the pathogenic agents. Many are asymptomatic carriers. An asymptomatic carrier is estimated to discharge  $1.5 \times 10^8$  (n=7) cysts a day. From the control point of view, these asymptomatic carriers should be treated and controlled.<sup>(6,7)</sup>

Infection is spread by contaminated food or water containing cysts from feces of asymptomatic carriers or infected persons or wastes of the community. Treatment of feces is an important factor. Untreated feces used as fertilizer for vegetables, or contaminating drinking water are an important mode of transmission. Infectious cysts may also be carried around by flies and cockroaches to contaminate foods.<sup>(8,9)</sup> Studies

also show that amoebic dysentery can also be transmitted through sexual behavior of homosexuals.<sup>(10,11)</sup>

Most infected persons are asymptomatic as the pathogenicity and the resistance of hosts differ. Clinical diagnoses thus are difficult and only identification of trophozoite or cyst from feces or tissues can confirm the infection. From public health point of view, serological test in a high infection area is the most effective way of knowing the status of infection. When infected, IgG and IgM can be detected from the serum of patient. IgM remains for a month, while IgG continues for one to two years.<sup>(12,13)</sup>

In the recent years, the infection of amoebic dysentery has been reported from the psychiatric centers in the northern and eastern parts of Taiwan. The mode of transmission is fecal-oral which appears more frequently in communities of poorer personal hygiene and sanitary conditions, and psychiatric patients are often in poor personal hygiene.<sup>(14,15)</sup> Literatures show that the serum antibody positive rates in psychiatric hospitals are around 7.5 to 75%.<sup>(16,17)</sup> Raniel reported in 1974 a serum antibody positive rate of 27.6% by IHA (Indirect Hemagglutination) method.<sup>(18)</sup> In August 1991, the Kaohsiung Medical College, in a survey of amoebic dysentery infections in the psychiatric centers in the middle and southern parts of Taiwan, came up with a positive rate of 13.3%.<sup>(19)</sup> Recently, cases of amoebic dysentery have been reported in Taiwan, some of them have even developed abscess of liver. Most of these cases are from the mountain and remote areas of the eastern part of Taiwan. In August 1990, for instance, a three-year old child of Kuang-yuan Village, Hai-tuan Township of Taitung County was reported to have died of liver abscess resulted from amoebic dysentery infection.

To understand the infection status of amoebic dysentery in the mountain and remote areas of Taitung County, a group of members from the Malaria and Parasite Division and the Field Epidemiology Training Program of the National Institute of Preventive Medicine of the Department of Health was sent in October 1991 to Kuang-yuan Village for mass-screening and epidemiological investigation to understand the infection status and the risk factors involved for the future planning of prevention programs.

## II. Methods and Materials

Residents of Kuang-yuan Village above the age of 6 years, 650 of them, were surveyed: 359 persons (55%) interviewed with questionnaire, 262 (40%) serologically tested, and 215 (33%) tested for feces.

Serological test: venous blood of 5 ml was taken before breakfast, left in room temperature for one hour, centrifugated at 2,000 rpm for five minutes to collect serum for testing with cellognost amoebiasis (Behring) reagent through IHA method; 0.025 buffer solution was placed in a V-shape micro-titration disc first, then 0.025 ml of serum was added and diluted, and finally 1% sheep blood suspension coated with

*Entamoeba histolytica* antigens was added; the suspension was mixed and placed at room temperature for two hours for the testing of antibody potency, and again next day. 1:256 reading is considered positive.<sup>(20)</sup>

**Fecal examination:** by the Formalin-ether centrifugal sedimentation method; one gram of feces was collected with wooden stick, placed in a bottle of 10% formalin and left for ten minutes; it was then filtered, added 10 ml of water, and then placed in a sedimentation tube for centrifugation at 2,000 rpm for one minute; after removing the suspension, 2-3 ml of ether was added, shaken for 20-30 seconds, and centrifugated again at 2,000 rpm for two minutes; the sediment was then sucked up, placed on glass, and added iodine to test the existence of either trophozoite or cyst.

**Questionnaire:** 7 questions for background information, 20 for living habits and environmental sanitation, 8 for clinical symptoms, and three for laboratory diagnosis, totaling 38 questions for identifying mode of transmission and risk factors. Interviewers were briefed in advance.

**Statistical analysis:** two softwares, Epi-info and SAS, were used for descriptive analysis; Chi-square and multiple logistic regression were also applied to understand the relations between variables.

### III. Findings

Laboratory testings and questionnaire interview took place during May and November 1991. 359 persons had been successfully interviewed, of them, 262 took serological testings to find 104 persons positive, giving a positive rate of 39.7%; 215 persons took fecal testings, with 14 positive at a positive rate of 6.4%; 5.8% had diarrhea with some blood (18/359). The operational definition for amoebic dysentery infection was: either positive by serological testing, positive by microscopic examination, or diarrhea with blood. By this definition, the amoebic dysentery infection rate among residents of Kuang-yuan Village was found to be 39.2% (141/359).

Of those infected, 46% were male (163/359), 55% female (196/359). 20% of those surveyed were under 11 years of age (71/359), of them, the infection rate was 48% (34/71); 30% were in age group 11 to 20 years (107/359), the infection rate, 36% (39/107); 7.5% in age group 21 to 30 years (27/359), the infection rate, 37% (10/27); 9.2% in age group 31 to 40 years (33/359), the infection rate, 33% (11/33); 11% in age group 41 to 50 years (41/359), the infection rate, 41.5% (17/41); 7.8% in the age group 51 to 60 years (28/359), the infection rate, 36% (10/28); 10% in age group 61 to 70 years (35/359), the infection rate, 40% (14/35), 4.8% above 70 years of age (22/359), the infection rate, 35% (6/17) (see Table 1).

Age and sex were found not to be significantly related to infection rates (see

chicken feces which attracted a high density of flies. Vegetables and fruits grown around houses were also contaminated by either human or animal feces. Houses were without screens to keep flies away. All these and the fact that most residents were of lower educational level, lower income and poorer nutritional status made the infection more likely to spread. That the high positive rate of 39.2% in this particular village, even higher than that of the psychiatric centers, is understandable.

4. The findings should be treated with reservation as the villagers are highly homogeneous and it was difficult to identify source of infection. Further studies should be made to compare the different life styles of aboriginal and non-aboriginal residents and their relationship with the disease.

## V. Recommendations

### 1. Improvement of sanitary facilities:

- a. flush-type public toilet with running water for hand washing should be built;
- b. water tank and water pipes should be improved to avoid any contamination; water should be treated;
- c. flies should be controlled;
- d. window screens should be set up.

### 2. Improvement of life style:

- a. health education in schools should be strengthened;
- b. health education of the public should be intensified;
- c. chemical fertilizers should replace animal wastes.

### 3. Improvement in disease control:

- a. the treatment and medication of patients should be improved;
- b. periodic screening and follow-up should be conducted.

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**Table 1. Risk Factors Related to Amoebic Dysentery**

Variables	No Surveyed		P value
	No. and % Infected	No. and % Not-Infected	
<b>Age</b>			<b>0.839</b>
< 11 Years	34 (47.9%)	37 (52.1%)	
11 — 20	39 (36.4%)	68 (63.6%)	
21 — 30	10 (37.0%)	17 (63.0%)	
21 — 40	11 (33.0%)	22 (67.0%)	
41 — 50	17 (41.5%)	24 (58.5%)	
51 — 60	10 (35.7%)	18 (64.3%)	
61 — 70	14 (40.0%)	21 (60.0%)	
> 70	6 (35.3%)	11 (64.7%)	
<b>Sex</b>			<b>0.633</b>
Male	66 (40.7%)	96 (59.3%)	
Female	75 (38.3%)	121 (61.7%)	
<b>Education</b>			<b>0.000733*</b>
Primary and less	59 (54.1%)	50 (45.9%)	
Primary	74 (34.6%)	140 (65.4%)	
Junior high	7 (35.0%)	13 (65.0%)	
Senior high	1 ( 9.1%)	10 (90.9%)	
College and above	0 ( 0.0%)	3(100.0%)	
<b>Monthly Income</b>			<b>0.000</b>
less than NT\$10,000	8 (22.2%)	28 (77.8%)	
10,000 — 20,000	61 (57.0%)	46 (43.0%)	
20,000 — 30,000	45 (52.9%)	40 (47.1%)	
30,000 — 40,000	3 (17.7%)	14 (82.4%)	
40,000 and more	2 (20.0%)	8 (80.0%)	
<b>Occupation</b>			<b>0.003</b>
Farming & Fishing	51 (47.2%)	57 (52.8%)	
Labor & Commercial	5 (20.0%)	20 (80.0%)	
Military, Civil Service	3 (18.8%)	13 (81.2%)	
Student	69 (63.9%)	99 (36.1%)	
Others	11 (73.3%)	4 (26.7%)	
<b>Area of Activity during Daytime</b>			<b>0.674</b>
Around house	43 (42.6%)	58 (57.4%)	
Mountain, field	30 (38.5%)	48 (61.5%)	
School	60 (38.7%)	95 (61.3%)	
Factory, working site	7 (38.9%)	11 (61.1%)	
Others	1 (14.3%)	6 (85.7%)	

**Table 1. Risk Factors Related to Amoebic Dysentery (Cont.)**

Variables	No Surveyed		P value
	No. and % Infected	No. and % Not-Infected	
<b>Duration of Stay At Home in a Year</b>			<b>0.771*</b>
less than 6 months	4 (33.3%)	8 (66.7%)	
more than 6 months	137 (39.5%)	210 (60.5%)	
<b>Source of Drinking Water</b>			<b>0.2032</b>
Simple water supply from spring	137 (56.8%)	204 (43.2%)	
Others	4 (22.2%)	14 (77.8%)	
<b>Treatment of Drinking Water</b>			<b>0.6254</b>
boiled each time	79 (46.2%)	92 (53.8%)	
often boiled, sometime from tap	12 (23.1%)	40 (76.9%)	
often from tap, sometime boiled	35 (36.8%)	60 (63.2%)	
always from tap	15 (36.6%)	26 (63.4%)	
<b>Handwashing Before Meal</b>			<b>0.3808</b>
each time	27 (36.5%)	47 (63.5%)	
often	14 (29.8%)	33 (70.2%)	
occasionally	89 (43.0%)	118 (57.0%)	
seldom	11 (35.5%)	20 (64.5%)	
<b>Handwashing After Toilet</b>			<b>0.1146**</b>
each time	28 (31.1%)	62 (68.9%)	
often	15 (30.0%)	35 (70.0%)	
occasionally	92 (48.4%)	98 (51.6%)	
seldom	6 (20.7%)	23 (79.3%)	
<b>Availability of Window Screen</b>			<b>0.0321**</b>
all windows screened	45 (38.8%)	71 (61.2%)	
some windows screened	60 (47.6%)	66 (52.4%)	
no window screened	36 (31.3%)	79 (68.7%)	
<b>Defecating Place</b>			<b>0.049</b>
in toilet	111 (42.4%)	30 (30.9%)	
outdoor	151 (57.6%)	67 (69.1%)	
<b>Cleaness of House</b>			<b>0.8060</b>
very clean	9 (34.6%)	17 (65.4%)	
clean	21 (26.3%)	59 (73.7%)	
fair	98 (50.5%)	96 (49.5%)	
dirty	9 (19.2%)	38 (80.8%)	
very dirty	2 (28.6%)	5 (71.4%)	

**Table 1. Risk Factors Related to Amoebic Dysentery (Cont.)**

Variables	No Surveyed		P value
	No. and % Infected	No. and % Not-Infected	
<b>Type of Toilet</b>			<b>0.097</b>
flush type at home	62 (38.5%)	99 (61.5%)	
flush not at home	74 (42.5%)	100 (57.5%)	
public toilet	3 (16.7%)	15 (83.3%)	
<b>Use of Tissue Paper after Toilet</b>			<b>0.988</b>
yes, tissue paper	128 (39.3%)	198 (60.7%)	
not tissue paper	13 (39.4%)	20 (60.6%)	
<b>Food Covered</b>			
food covered and stored	118 (37.9%)	193 (62.1%)	
not covered and stored	23 (47.9%)	25 (52.1%)	
<b>Use of Left-Over Foods</b>			<b>0.0000**</b>
never	11 (19.6%)	45 (80.4%)	
rarely	18 (21.9%)	64 (78.1%)	
occasionally	96 (54.9%)	79 (45.1%)	
often	16 (35.6%)	29 (64.4%)	
<b>Source of Vegetable</b>			<b>0.000</b>
locally produced	32 (21.1%)	120 (78.9%)	
produced elsewhere	109 (52.7%)	98 (47.3%)	
<b>Eating Raw Vegetable</b>			<b>0.000**</b>
never	18 (17.8%)	83 (82.2%)	
rarely	50 (39.7%)	76 (60.3%)	
occasionally	67 (56.8%)	51 (43.2%)	
often	6 (42.9%)	8 (57.1%)	
<b>Farming Practice</b>			<b>0.000</b>
use feces as fertilizer	15 (29.5%)	36 (70.5%)	
use chemical fertilizer	100 (59.2%)	69 (40.8%)	
do not use fertilizer	3 (9.7%)	28 (90.3%)	
use other fertilization method	12 (48.2%)	13 (52.0%)	
do not farm	10 (13.5%)	64 (86.5%)	
<b>Raise Livestock</b>			<b>0.1849</b>
no	11 (28.2%)	28 (71.8%)	
yes	130 (40.6%)	190 (59.4%)	

**Table 1. Risk Factors Related to Amoebic Dysentery (Cont.)**

Variables	No Surveyed		P value
	No. and % Infected	No. and % Not-Infected	
<b>Waste Water Disposal</b>			<b>0.625*</b>
into ditch	107 (40.8%)	155 (59.2%)	
into nearby ground	25 (39.1%)	39 (60.9%)	
into nearby field	4 (25.0%)	12 (75.0%)	
into pond	3 (42.9%)	4 (58.1%)	
into stream	2 (22.2%)	7 (77.8%)	
<b>No. of Flies Around House (Summertime)</b>			<b>0.0476**</b>
not seen	2 (22.2%)	7 (77.8%)	
rarely seen	6 (23.1%)	20 (76.9%)	
occasionally seen	106 (51.7%)	99 (48.3%)	
often seen	27 (22.7%)	92 (77.3%)	

\* Fisher test

\*\* Chi-square test for trend

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