

Allergic Family History as a Protective Determinant to Helminthic Infection

Pasuree Sangsupawanich MD, PhD*, Virasakdi Chongsuvivatwong MD, PhD**,
Ladda Mo-suwan MD*, Chanpen Choprapawon MD***

* Department of Pediatrics, Faculty of Medicine, Prince of Songkla University, Songkhla, Thailand

** Epidemiology Unit, Faculty of Medicine, Prince of Songkla University, Songkhla, Thailand

*** Prospective Cohort Study of Thai Children, Health System Research Institute, Bangkok, Thailand

Objective: Investigate the resistance to helminths in children with an allergic family history.

Material and Method: The study was undertaken as part of the Prospective Cohort Study of Thai Children (PCTC) that followed all births in the year 2001 from rural districts in Thailand. The family histories of allergic diseases were validated by the physicians' diagnoses and medical record reviews. Fresh stool examinations were carried out at 18 to 36 months of age.

Results: Of 1,076 live births in the cohort, 659 children had complete information. A family history of allergy presented in 5.4% of the children. The prevalence of any helminthic infection, *Ascaris lumbricoides*, *Trichuris trichiura*, and hookworm were 25.0%, 18.2%, 9.2%, and 5.3%, respectively. The adjusted odds ratio of a family history of allergy for helminthic infection was 0.28 (95% CI, 0.08-0.95).

Conclusion: A family history of allergic diseases independently increases resistance to helminthic infection.

Keywords: Helminth infections, Allergic family history, Protective effect

J Med Assoc Thai 2013; 96 (10): 1310-2

Full text. e-Journal: <http://jmat.mat.or.th>

Helminthic infection affected at least one-quarter of the world's population⁽¹⁾. The Th2 cytokines are critically important for resistance to helminths⁽²⁾. As these cytokines were also high in allergic patients, therefore these patients were less susceptible to helminthic infection⁽³⁻⁵⁾. However, no evidence of resistance to helminths in normal individuals with allergic family history has been reported.

Material and Method

Study area and population

The study was undertaken as part of the Prospective Cohort Study of Thai Children (PCTC). The PCTC is a population-based birth cohort study that followed all births in the year 2001 from four rural districts in Thailand. The report was confined to Thepa District in the southern part of Thailand of which data on soil-transmitted helminthic infection were available. The National Ethics Committee of the Ministry of Public Health approved the study. All parents agreed by written informed consent.

Correspondence to:

Sangsupawanich P, Department of Pediatrics, Faculty of Medicine, Prince of Songkla University, Songkhla 90110, Thailand.

Phone: 074-451-251, Fax: 074-212-900

E-mail: pasurees@gmail.com, pasuree.s@psu.ac.th

Data collection

The family histories of allergic diseases (history of atopic eczema, asthma, or allergic rhinitis of mother, father, and previous children) were validated by medical record reviews. Feeding data were recorded prospectively at the ages of three, six, and 12 months. Soil specimens from the foot-washing area (at the entrance of the house) were examined for helminth eggs at age 12 months by Uga's technique⁽⁶⁾. Fresh stool examinations using the Kato-Katz smear technique were carried out at 18 to 36 months of age.

Statistical analysis

The outcome defined as helminthic infection was modeled using logistic regression. Statistical analyses were carried out using R software (The Comprehensive R Archive Network). The statistical significance level was set at 0.05.

Results

Of 1,076 live births in the cohort, 659 children had complete information. Most mothers (66.0%) had primary school education. A family history of allergy presented in 5.4% of the children. From the soil examination, 118 specimens (17.9%) were contaminated with helminth eggs such as *Trichuris trichiura* (11.6%),

Table 1. Multiple logistic regression between helminthic infection and studied variables (n = 659)

Variables	Adjusted OR* (95% CI)	p-value
Family history of allergy	0.28 (0.08-0.95)	0.04
Type of milk: 0-12 months		
Breast fed only	1	
Bottle fed only	0.82 (0.50-1.34)	0.43
Mixed feeding	0.70 (0.46-1.09)	0.11
Soil contamination	1.67 (1.08-2.60)	0.02
Mother's education		
0-6 years	1	
6-12 years	0.41 (0.25-0.68)	<0.01
>12 years	0.21 (0.06-0.71)	0.01

* Adjusted for age, sex and listed variables in the Table
OR = odds ratio; 95% CI = 95% confidence interval

Ascaris lumbricoides (8.8%), and hookworm (0.4%). The prevalence of any helminthic infection, *Ascaris lumbricoides*, *Trichuris trichiura*, and hookworm were 25.0%, 18.2%, 9.2%, and 5.3%, respectively. For positive specimens, the median egg counts were 13,984 eggs/g feces (range 115 to 291,318) for *Ascaris lumbricoides*, 483 eggs/g feces (range 23 to 176,226) for *Trichuris trichiura*, and 230 eggs/g feces (range 46 to 14,214) for hookworm. From multiple logistic regression, the adjusted odds ratio was 0.28 (95% CI, 0.08-0.95) (Table 1) suggesting significant protection with minimal confounding effects from the other variables. There was no evidence of protection from breastfeeding. As expected, high maternal education was protective, whereas soil contamination increased the risk of infection.

Discussion

The findings demonstrated that children born to atopic parents had increased resistance to helminthic infection. Epidemiological study of helminthic infections suggests that a proportion of up to 44% of the variance in worm burden was explicable by additive genetic effects compared to 3 to 14% of variance explicable by measured environmental effects (e.g. household effects)⁽⁷⁾. Helminth-specific IgE and Th2 cytokines have been associated with resistance in a number of human helminthic infections^(2,8). A high IgE and Th2 cytokines levels has been reported among children born to atopic parents⁽⁹⁾. Therefore, this genetic condition may favor the production of helminth-specific IgE, thus conferring protection against helminths in these children. Nevertheless, the

link between genetic components and the resistance to helminthic infection has not been elucidated directly and would be an important subject for further research.

Acknowledgement

The authors wish to thank the children and parents in Thepa District for their cooperation.

Funding/Support

This work was a part of PhD thesis and supported by the Royal Golden Jubilee PhD. Grant from The Thailand Research Fund. The Prospective Cohort Study of Thai Children was supported by Health Systems Research Institute, Ministry of Public Health, and The Thailand Research Fund.

Potential conflicts of interest

None.

References

1. Chan MS. The global burden of intestinal nematode infections—fifty years on. *Parasitol Today* 1997; 13: 438-43.
2. Bradley JE, Jackson JA. Immunity, immunoregulation and the ecology of trichuriasis and ascariasis. *Parasite Immunol* 2004; 26: 429-41.
3. Lynch NR, Hagel IA, Palenque ME, Di Prisco MC, Escudero JE, Corao LA, et al. Relationship between helminthic infection and IgE response in atopic and nonatopic children in a tropical environment. *J Allergy Clin Immunol* 1998; 101: 217-21.
4. Grove DI, Forbes IJ. Increased resistance to helminth infestation in an atopic population. *Med J Aust* 1975; 1: 336-8.
5. Huang SL, Tsai PF, Yeh YF. Negative association of *Enterobius* infestation with asthma and rhinitis in primary school children in Taipei. *Clin Exp Allergy* 2002; 32: 1029-32.
6. Uga S. Prevalence of *Toxocara* eggs and number of faecal deposits from dogs and cats in sandpits of public parks in Japan. *J Helminthol* 1993; 67: 78-82.
7. Quinnell RJ. Genetics of susceptibility to human helminth infection. *Int J Parasitol* 2003; 33: 1219-31.
8. Pearce EJ, Kane M, Sun J, Taylor J, McKee AS, Cervi L. Th2 response polarization during infection with the helminth parasite *Schistosoma mansoni*. *Immunol Rev* 2004; 201: 117-26.

9. Gabrielsson S, Soderlund A, Nilsson C, Lilja G, Nordlund M, Troye-Blomberg M. Influence of atopic heredity on IL-4-, IL-12- and IFN-gamma-producing cells in in vitro activated cord blood mononuclear cells. Clin Exp Immunol 2001; 126: 390-6.

ประวัติโรคภูมิแพ้ในครอบครัวเสมือนหนึ่งตัวกำหนดป้องกันการติดเชื้อหอนพยาธิ

ภาสุรี แสงสุภวานิช, วีระศักดิ์ จงสู่วิวัฒน์วงศ์, ลัดดา เหมาะสุวรรณ, จันทรเพ็ญ ชูประภาวรรณ

วัตถุประสงค์: ความมุ่งหมายของการศึกษาคือเพื่อตรวจสอบความต้านทานต่อหอนพยาธิในเด็กที่มีประวัติโรคภูมิแพ้ในครอบครัว
วัสดุและวิธีการ: การศึกษาเป็นส่วนหนึ่งของโครงการวิจัยระยะยาวในเด็กไทย ซึ่งติดตามทุกการคลอดในอำเภอเทพา จังหวัดสงขลา ระหว่างเดือนธันวาคม พ.ศ. 2543 ถึง เดือนพฤศจิกายน พ.ศ. 2544 ประวัติโรคภูมิแพ้ในครอบครัวได้รับการตรวจสอบโดยการวินิจฉัยโดยแพทย์ และทบทวนบันทึกทางการแพทย์ เด็กได้รับการตรวจอุจจาระเพื่อวินิจฉัยหอนพยาธิเมื่ออายุ 18 ถึง 36 เดือน
ผลการศึกษา: เด็กในกลุ่มศึกษาจำนวน 1,076 ราย ได้รับการตรวจครบถ้วน 659 ราย เด็กร้อยละ 5.4 มีประวัติโรคภูมิแพ้ในครอบครัว ส่วนอุบัติการณ์ของการติดเชื้อหอนพยาธิใดๆ หอนพยาธิไส้เดือน พยาธิเส้นม้วน และพยาธิปากขอ เท่ากับร้อยละ 25.0, 18.2, 9.2 และ 5.3 ตามลำดับ ค่า *adjusted odds ratio* ของประวัติโรคภูมิแพ้ในครอบครัว สำหรับการติดเชื้อหอนพยาธิ เท่ากับ 0.28 (95% CI, 0.08-0.95)

สรุป: ประวัติโรคภูมิแพ้ในครอบครัวเป็นตัวแปรอิสระเพิ่มความต้านทานต่อการติดเชื้อหอนพยาธิ
