Enterobius vermicularis is a common intestinal parasite in children worldwide. It is more prevalent in preschool children, who are more active and in more direct contact with each other compared to adults, and are often in overcrowded environments [1, 2]. In addition, complete eradication of enterobiasis is difficult due to frequent reinfection, no exact examination techniques, and incomplete eradication among individuals even after treatment [3].

E. vermicularis infection is also widespread among preschool children in the Republic of Korea (Korea), and varies according to the age group and region [4-7]. However, no study on the prevalence of E. vermicularis has been conducted in Jeollanam-do, the southwestern province of Korea, and no yearly survey of E. vermicularis infection in the same region has been performed among preschool children.

We investigated on the prevalence of E. vermicularis infection, and changes in the egg positive rate (EPR) among preschool children in Muan-gun, Jeollanam-do, Korea during the period from 2008 to 2009. A total of 2,347 preschool children, including 1,159 (28 kindergarten children) in 2008 and 1,188 (26 kindergarten children) in 2009, were examined (Fig. 1).

The survey was conducted by the Muan-gun Local Health Service Center as a periodic health check for E. vermicularis infection among preschool children. Children voluntarily participated in this survey under permission of parents and teachers. The egg detection for E. vermicularis was performed using the cellophane-tape perianal swab method, which was performed by parents between 7 and 9 a.m., according to the instructions provided by the study researchers. Samples were collected by teachers and then transported to the Division of Malaria and Parasitic Diseases, Korea Centers for Disease Control and Prevention, for assessment by qualified technicians via light microscopy. Comparison of categorical variables was conducted via the chi-square test, with statistical significance defined using a 95% confidential interval (P < 0.05). All statistical analyses were performed using SPSS software (ver. 17.0K).

The overall EPR for 2 years was 4.4%. The geographic region with the highest EPR in 2008 was Samhyang-eup, and in 2009, it was Hyeongyeong-myeon and Unnam-myeon, and the EPR was similar each year (Tables 1 and 2). The demographic groups with the highest EPR were 5-year-old boys and 6-year-old girls in 2008, and 5-year-old boys and 7-year-old girls in 2009, and the highest EPR was found in the group of 5-year-old children (Table 2). The EPR among preschool children in Muan-gun,
Fig. 1. Areas surveyed for *Enterobius vermicularis* infection in Muan-gun, Jeollanam-do, the southwestern province of Korea.

Table 1. Number of egg-positive children in 2008 and 2009 in 9 regions of Muan-gun, Jeollanam-do, Korea

| Mark | Region             | No. positive / No. examined (%) | 2008 | 2009 |
|------|--------------------|---------------------------------|------|------|
| A    | Illo-eup           | 1/125 (0.8)                     | 3/112 (2.6) |
| B    | Muan-eup           | 18/295 (6.1)                    | 20/381 (5.2) |
| C    | Samhyang-eup       | 4/46 (8.7)                      | 0 (0.0) |
| D    | Hyeongjeong-myeon  | 5/110 (4.5)                     | 0/119 (0.0) |
| E    | Unnam-myeon        | 4/88 (4.5)                      | 5/79 (6.3) |
| F    | Cheonggye-myeon    | 10/323 (3.1)                    | 12/209 (5.7) |
| G    | Mongtan-myeon      | 0/3 (0.0)                       | 0/113 (0.0) |
| H    | Mangun-myeon       | 3/69 (4.3)                      | 0/113 (0.0) |
| I    | Haeje-myeon        | 3/100 (3.0)                     | 4/104 (3.8) |
| Total|                    | 48/1,159 (4.1)                  | 54/1,188 (4.6) |

*The regions surveyed in this study (in Fig. 1).*

Jeollanam-do was lower than that reported in other regional studies [4-7]. In general, it is known that the infection rate determined by a single examination often underestimates the real rate of infection [8-10]. In the present study, examinations were performed only once a year. All the egg-positive children were medicated twice, with a 2-week interval between each administration, and there was no subsequent re-examination. Therefore, it is possible that the real infection rate was underestimated in our study [8,9]. Further repeated examinations for *E. vermicularis* infection are necessary to acquire an accurate estimation of the true infection rate in the population.

Among the examined population, 389 preschool children were examined twice, once in 2008 and once in 2009. The EPR in 2009 was about double of that in 2008, and was similar for boys and girls each year (Table 3). By the age of the preschool children, the EPR in the 5-7-year-old children was significantly higher than that in the 0-4-year-old children in both 2008 and 2009. These results were consistent with those of a previous report by Lee et al. [6].

Changes in EPR from 2008 to 2009 among these 389 preschool children are presented in Table 4. There was no signifi-
Table 2. Egg positive rate of Enterobius vermicularis by age and sex

| Age (year) | Boys 2008 | Boys 2009 | Subtotal 2008 | Girls 2008 | Girls 2009 | Subtotal 2008 | Total 2008 | Total 2009 | Total |
|------------|-----------|-----------|---------------|------------|------------|---------------|-----------|-----------|-------|
| <3         | 1/52 (1.9)| 0/66 (0)  | 1/118 (0.9)   | 3/53 (5.7) | 0/60 (0)   | 3/113 (2.7)   | 4/105 (3.8) | 0/126 (0) | 4/231 (1.7) |
| 3          | 1/120 (0.8)| 3/83 (3.6)| 4/203 (2.0)   | 0/114 (0)  | 3/82 (3.7) | 3/196 (1.5)   | 1/234 (0.4) | 6/163 (3.6)| 7/399 (1.8) |
| 4          | 4/149 (2.7)| 5/151 (3.3)| 9/300 (3.0)  | 6/142 (4.3)| 8/133 (6.0)| 14/275 (5.1)  | 10/291 (3.4)| 13/284 (4.6)| 23/575 (4.0) |
| 5          | 13/143 (9.1)| 11/142 (7.8)| 24/285 (8.2)| 6/111 (5.4)| 9/160 (5.6)| 15/271 (5.5)  | 19/254 (7.5)| 20/302 (6.6)| 39/556 (7.0) |
| 6          | 5/71 (7.0)  | 6/82 (7.3) | 11/153 (7.2) | 5/78 (6.4) | 3/90 (3.3) | 8/168 (4.8)   | 10/149 (6.7)| 9/172 (5.2)| 19/321 (5.9) |
| 7          | 2/58 (3.5)  | 2/82 (2.4) | 4/140 (2.9)  | 2/68 (2.9) | 4/57 (7.0) | 6/125 (4.8)   | 4/126 (3.2)| 6/139 (4.3)| 10/265 (3.8) |
| Total      | 26/593 (4.4)| 27/606 (4.5)| 53/1,199 (4.4)| 22/566 (3.9)| 27/582 (4.6)| 49/1,148 (4.3)| 48/1,159 (4.1)| 54/1,188 (4.6)| 102/2,347 (4.4) |

Table 3. Egg positive rate of Enterobius vermicularis by sex and age in children examined in both 2008 and 2009

| Gender | No. positive/No. examined (%) | P-value |
|--------|-----------------------------|---------|
| Male   | 197 (11.6)                  | 0.869   |
| Female | 192 (10.5)                  | 0.926   |

Table 4. Changes in egg positive rates of Enterobius vermicularis by age and sex in children examined in both 2008 and 2009

| Sex     | Total 2008 | Total 2009 | P-value |
|---------|------------|------------|---------|
| Male    | 197 (4.6)  | 2 (1.0)    | 0.9890  |
| Female  | 192 (4.2)  | 2 (1.0)    | 15 (7.8)| 172 (8.7) |

Individually, those who were egg positive in 2008 remained egg positive in 2009 (P-P), those egg positive in 2008 changed to egg negative in 2009 (P-N), those egg negative in 2008 changed to egg positive in 2009 (N-P), and those egg negative in 2008 remained egg negative in 2009 (N-N).

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