

## A female *Enterobius vermicularis* picked up in a cellotape anal swab

In the report of Chai *et al.* (1997), a female pinworm of 7.8 mm long and 0.5 mm wide was described. The report was interesting because the finding was in agreement in part with the experimental results described earlier by Akagi (1973). After ingesting infective eggs of *E. vermicularis*, Akagi found that some females were excreted in feces after 35-40 days without oviposition. On the 43rd day, a mature female appeared at anus but not oviposited; from 45-49 days, all worms appearing around anus oviposited normally. The finding was important because the interval between infection and female migration was longer than that reported previously, and because the interval is critical in designing repeating chemotherapy schemes for familial enterobiasis. In 1879, Grassi reported the interval as 15-28 days (Grove, 1990) which became later basic data for life span of human pinworm (Cram, 1943). In this connection, Cho *et al.* (1985b) described chronologic growth pattern of female pinworms after experimental infections. According to them, gravid females were hardly collectable within 28 days. Longest females of 28 days old were 5-5.5 mm long and had mostly empty uterus. When based on their growth rate, estimated age of the 7.8 mm long female is at least 35-40 days. Taken together, the female of 7.8 mm in length, picked up in a cellotape, suggests that anal migration may occur in females younger than those Akagi described. The estimated age of the female also supports the result of Akagi (1973) about the life span.

Despite its significance, the report of Chai *et al.* (1997) was not immaculate. It is not unusual to collect female pinworms with ruptured uterine loops. The described female nematode was filled with immature eggs in her

entire body cavity, indicating that thin wall of the uterine loops were either degenerated or ruptured, most probably in desiccation. In complete females of 7.8 mm in length, uterine loops were normally extending from levels of anterior to vulva to anus (Cho *et al.*, 1985b). In addition, defining it as over-gravid seems groundless. When egg numbers in female *E. vermicularis* were counted, females longer than 9 mm had 15,000 eggs or more. In females of 7.5-8.0 mm long, egg numbers ranged in 100-10,000/female (Cho *et al.*, 1985a). In using the term over-gravid in this case, therefore, egg number should have been supplemented to make readers convinced. Dispersion of eggs in body is an insufficient criterion in determining a degree of gravity in female *E. vermicularis*, in an apparently degenerated female.

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**Reply:**

I thank for the critical and valuable comments given by Dr. S. Y. Cho on our report of an unusual over-gravid female *Enterobius vermicularis* recovered from a child (Chai *et al.*, 1997). He questioned about the pertinence of using the terminology, 'unusual' and 'over-gravid' for the worm reported, both of which we also hesitated to use. According to his comments, the uterine loops of the worm might have been ruptured due to degeneration or dessication, and immature eggs liberated to occupy the space of the anterior and posterior end portion of the body. Thus he suggested that the worm could have been a normal mature female rather than an unusual and over-gravid one. I think his suggestion might be true. However, there are several points which should be taken into considerations. First, our specimen was, at the time of collection, already full of eggs from the anterior end to almost posterior end of the body. Photography of the worm was done later, unfortunately after dessication occurred. The uterine loops might have been ruptured during collection of the worm. But the specimen in Fig. 1 (Chai *et al.*, 1997) showed that the outer covering (=cuticle) of the worm was clearly intact, supporting that mechanical trauma on the worm was less probable. Still another factor that should be considered is spontaneous rupture of the uterine loops, in situations such as overload of eggs. The term 'unusual' was used to include this possibility, if spontaneous rupture of the uterus occurs unusually.

His comment on the 'over-gravidity' of the

worm, especially the necessity of counting the number of uterine eggs, has sound background, and is really agreed by us. Unfortunately, however, it was hardly possible for us to count the number of eggs within the intact worm, nor we tried to destroy it for counting the number of eggs. Still, the exceptionally wide dispersion of eggs from the anterior end to nearly the posterior end of the body strongly suggested that the number of eggs might exceed at least that of the normal female specimen of 7.5-8.0 mm in length, which was reported to be in the range, 100-10,000 (Cho *et al.*, 1985). If the uterine loops had been intact (it is now very difficult to verify from the specimen) and egg dispersion within the body was such, it should be regarded as an over-gravid worm, based on the criteria of Cho *et al.* (1982). The early termination of the female worm might have been caused by over-gravidation. The worm was not so old enough to migrate out. Too many eggs in the uterine loops or extra-uterine spread of eggs might have terminated its life.

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